The FOUNDRY

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Castings Smooth the Wrinkles When Ironing Day Comes

WITH the old thermometer hitting around 100 in the shade and the weatherman promising little more than *Fair and Warmer*, the housewife is glad that modern science, in the march of progress, has developed numerous mechanical appliances which make the task of keeping the house in order a trifle less irksome. The heavy sale of various improved types of irons, both electric and gas, during the past few

Drudgery Has Been Removed from Housework By Modern Appliances

years displays the enthusiasm with which advances in that field have been received. A number of years ago practically all ironing was accomplished with the flat iron. Then came the various types of irons which were heated with gas, gasoline or electricity. Perhaps the latest development in this field is the ironing machine, which now appears to be gaining favor rapidly. The history of the development of the various types of irons has been allied closely with the foundry industry, because practically all parts of the irons are cast, and in the new ironing machine, castings play a prominent part. While figures on the total production of all types of irons are not available, the fact that 3,633,307 electric irons were produced in a recent year with a value of $8,198,941 indicates the proportions of the industry.

Find Where Castings Can Be Sold

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Your BOY

DOES the parent of today stop for a moment and consider what his boy is going to be in 20 years time? Every father and every mother desires their children to make a mark in the world, to be somebody worth while and to achieve, but few parents today really guide their children into the path which leads to better things.

The apprenticeship of life is like the apprenticeship of trade. To one who does not start right success is problematical, so problematical that a little slip may result in a disastrous failure. Therefore, stop and think what it means to start right, and seek a way to start *your* boy right. The boy of today is the father of tomorrow, a future citizen, and a builder of this country's future prosperity. He is a cog in the great wheel of life. How can he be a cog, taking his fair share of the strain, if you do not develop him in strength of mind and character so that he will know the how and the why of life's labors.

These questions can be answered only by education, and education in apprenticeship is one of the best ways. In apprenticeship a boy develops the will to work and to achieve. The world progresses by work. The worker is the mainstay of industry. Without the worker, the industrial fabric collapses. When nothing but drones are produced, the beehive community ceases to produce. The drones eat up the production of others; then they die of starvation. That is exactly what would happen to the people in the world if the workers ceased to produce and all became drones.

A worker is a producer, or he is one who plans for the producer. He works either with his hands or with his brain, but the important thing is—he works. He who never has worked with his hands cannot plan efficiently with his brain. He must know something of what the handworker has to do that he may use his brain to advantage. He gains this knowledge by serving an apprenticeship in his chosen vocation. There is no limit to the heights to which he can go, providing he has the proficiency of the hands, the education of the brain and the will to work. Co-ordinate these three important factors in training and the power to achieve results.

Now as to education and to its meaning. It does not mean that a man must be a college graduate, a mathematician, a scientist, a man who can juggle with the fourth dimension to be a success, or to be an important cog in the wheel. Higher education would be a distinct disadvantage to the boy starting life supposing that it were possible to attain it. But it is essential for a boy learning a trade only to have a common school education, added to a will to work with his hands. Work is the elevator to better and higher things. There *is* dignity in work.

In a job well done is self-respect. A boy can look with pardonable pride on his first job into which he has worked in a bit of his heart. Later in life he may become a highly skilled mechanic, a builder of locomotives, or of large power plants or a bridge, he may on the other hand never be more than a first class man on the planer or the lathe, or a first class molder, but it does not

Start Him Right by an Apprenticeship

By William Armstrong

matter, he is doing his country's work just as loyally in the highest as in the lowest position. The world needs hand workers just as much as it wants brain workers. He who uses his hands skilfully is just as important to the functioning of the great wheel, and he gains the right viewpoint through apprenticeship to his trade. That is the foundation of his worth as a real producer.

The greatest steamship that ever was built would fall to pieces if it were not for the little rivets which hold the plates together. Therefore it is apparent that the greatest fabric depends for its strength upon the smallest unit. It will be seen that no matter how small or insignificant a job may be, it is important.

Interest is to work as oil is to machinery. If you don't like your job you will soon grind yourself to pieces. You will waste your nervous as well as physical force, and shorten your useful life, your production is less and your product is inferior. Therefore, it is necessary to choose your vocation wisely, and assure your future by apprenticeship in your chosen vocation.

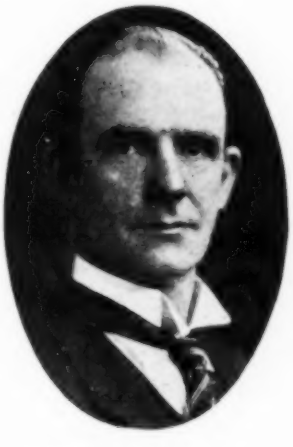
There are no easy jobs in this world which are worth while. Everything worth doing requires effort. If you like the work you achieve more with less loss of strength. What we teach our children today is the basis of what they will teach their children tomorrow. If the teaching is fundamentally right, then all will be well with the future prosperity and integrity of the nation. If the teaching is basically wrong then we can only expect to reap the whirlwind in the future. Therefore let those parents who are interested in their children's future think about preparation for it.

The parents have a better chance than anyone to judge what work best suits their boy. A child's future work generally is reflected in his play or in his most absorbing hobby. This may be only an indication, but it is worth while to observe and a little general education along this trait may be invaluable, but do not try to overeducate a boy in his early life. In most cases it imposes useless hardship on the parent and it puts into the boy's head wrong ideas. There are too many lawyers, too many doctors, too many office workers, but there are too few skilled workers in the trades. The metal trade is a wide field with great opportunities for the skilled worker. It offers a brilliant future to the boy who is willing to work and to learn.

The industry is as important as agriculture. Almost everything we use today is composed of metal or requires the service of metal in its production or delivery. Castings are basic products.

Acquired First Hand Knowledge of Apprenticeship

LONG and varied experience has fitted the author of this article to speak with authority on the problem of educating youth. Further, his position as director of training, Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., has put him in intimate contact with what the modern foundry has to offer in preparing boys for their lifetime occupations. Mr. Armstrong in his own youth served a seven-year apprenticeship in England, starting when he was 14 years old. His education was that afforded in the public and technical schools, where he received his preparation as a mechanical engineer. He has had charge of large plants and has directed large personnels in various establishments. He did pioneer work on the exhaust steam turbine in Great Britain and Canada. During the World war he was a naval commander and for the last two years of the conflict was directing engineer for the British admiralty in charge of the manufacture of submarine mines and other defensive equipment. With the Waterbury Farrel company he is directly responsible for developing a training system that will produce workmen of the required knowledge and skill and at the same time will afford a valuable education to the boys entering the apprenticeship.



William Armstrong

Among the many metal trades branches none is more important than the foundry worker, none so well paid as this skilled craftsman, none requires more intelligence, such a variety of knowledge, and no trade offers such opportunities for advancement.

The present day foundryman makes castings in iron, steel, bronze, brass or aluminum. The work is not easy, yet it is not extremely hard. It requires a good physique, but nothing out of the common. For the healthy strong boy, willing to work there is no better trade today. It is more steady than that of workers in other metal trades. It is not a seasonable trade, and a boy will do well to consider this branch of industry in choosing his life work.

Apprenticeship means placing one's self under contract with a firm that can and is willing to teach the practical manipulation of tools and methods, and at the same time co-ordinating the same with theoretical instruction that the apprentice may become a skilled craftsman.

The boy of today has greater advantages than the boy of 25 or 30 years ago, because he can now *learn* and *earn*. Reliable industrial concerns will start boys at a living wage, give them schooling, practical and theoretical education. Years ago a boy had to learn his trade under considerable hardship and disadvantage. His wages were poor indeed, his hours were long, his parents had to be prepared to support him almost entirely for two or three years. He was not given any instructions beyond what he could pick up in the shop among the men, or what the foreman felt inclined to give him. His theoretical education was obtained by home study or at night school.

Today many far-seeing business men, employers, and leaders of industry have the boy's well-being at heart. They perhaps are selfish in their benevolence, but nevertheless the movement is in favor of the boy. These men see that the prosperity of the nation depends on the proper training of youth, but there are two sides to the question which must always be kept in mind. Industry is willing to train youth, but youth must be willing to accept training with its demand on his own efforts, his loyalty and his honor, to carry through his part of the contract. Industry can point the way and provide the knowledge, but the youth is what he makes of himself.

Of all craftsmen employed in metal working industries the molder and the coremaker need most to be intelligent and skilled. They make the actual metal castings that are the necessary part of all types of machines and conveyances used in modern life.

The draftsman or designer expresses his ideas in drawing, the patternmaker constructs in wood or metal the pattern, the molder or coremaker takes the pattern and produces castings and thus puts the ideas of the designer into actual form, after which the machinist finishes the castings.

Molders and coremakers are employed in every part of the country. Our foundries, and machine shops cannot get along without them.

Some make castings in brass, others in iron, others in steel, and others in malleable iron. A slightly different training is necessary for each type of molding though similar tools are used and these tools are common, and inexpensive. No other skilled craftsman can get along with so few simple tools as the molder and the coremaker. This again indicates that intelligence and skill must be of a high order. Brushes, shovels, sifting screens, and bellows are special, though simple, tools which are employed by the worker to complete his work of molding or coremaking. He uses rammers for packing and pounding the sand around the pattern, a bar is used for leveling the top of the mold, a swab is used to moisten the sand around the edge of the pattern, a gate cutter is used to form a channel through which the metal enters, and the lifting pin draws the patterns out of the sand. The pattern is shaken loose from the mold by the rapping bar. There are a number of other kinds of small tools called slicks and trowels which are used for finishing and smoothing mold surfaces.

All metals used in casting are melted in some kind of furnace or cupola, and poured into molds of damp sand where the metal cools. After cooling the sand is broken away and the rough metal casting is cleaned and dressed.

The work of the molder is to set

NO BOY can fail to appreciate the opportunity to create, the growing ability to "make things," as he advances in his training in foundry apprenticeship.

the pattern in the sand in such a manner that it leaves an impression when it is withdrawn. This impression shapes the outside of the casting, while the core, which usually is baked before being placed in the mold, forms the inside of the casting. The chief operations of molding consist of placing the pattern in the sand and ramming the sand firmly around the pattern, withdrawing the pattern, placing the core in the mold, and pouring the fluid metal into the completed mold.

There is no more danger working in the foundry today than in the machine shop or the pattern shop. Observance of safety rules eliminates danger. Accidents can happen in the foundry just as they can in any in any other branch of a business. Modern machinery has done away with much of the heavier work. Labor-saving machinery has done away with much of the muscular strain.

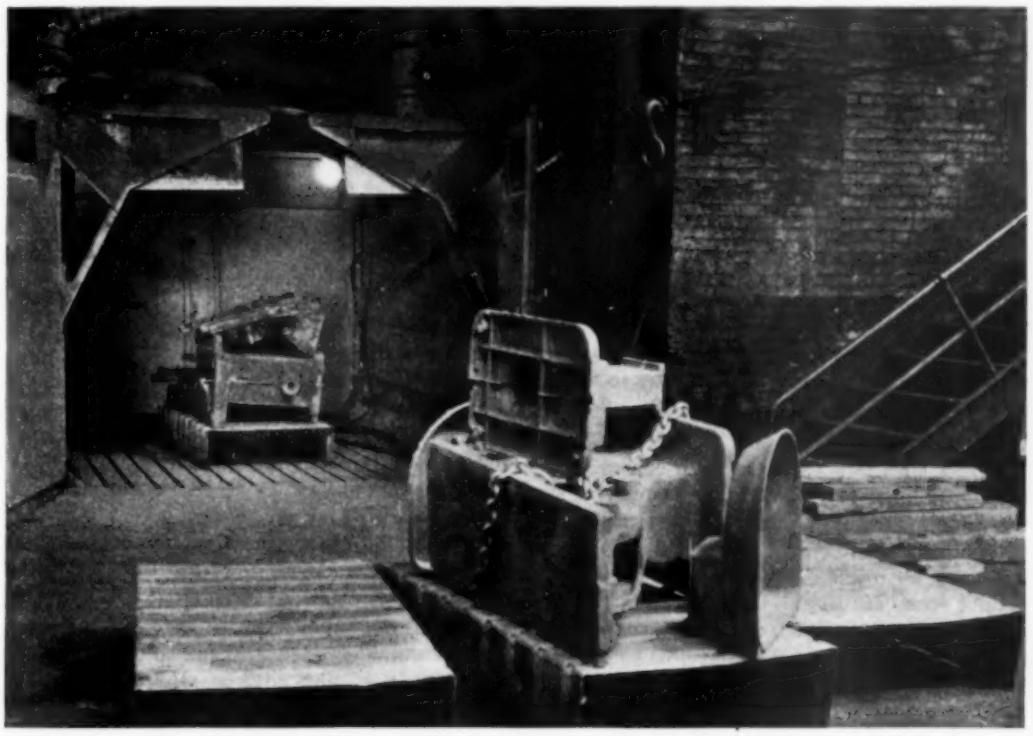
Foundry work is dirty, but it is the kind of dirt which can easily be described as *clean*. It is not greasy and can be washed off easily. Modern foundries are equipped with warm-water shower baths and wash rooms, clothes lockers and dressing rooms, so that a foundryman walks out from his work looking as clean as when he started, and much cleaner than many other workers. The working hours are about the same as those for machinists, the pay is better for the skilled man.

Another matter which is hazy in the minds of most people, both parents and boys, is what a molder has to know. The boy who wishes to become a molder or coremaker must be prepared for two important things; to learn how to work with his hands to get his practical training and to learn how to work with his head to be able to apply intelligently what his hands are trained to do. Theory and practice go hand in hand. Trade science is essential and he must be prepared to study in his own time to get the latter knowledge. The practical training is of the first importance, but a man is only partly trained unless he obtains the theoretical knowledge.

Many up-to-date plants are preparing to help the boy get a thorough knowledge of both the practical and the theoretical knowledge. They give a boy the chance of taking several hours per week with full pay to attend school or plant class on the company's time, and provide an instructor to teach the necessary theory and in subjects directly related to the practical work. The branches usually taught in class are shop sketching, shop drawing, blue print reading, shop arithmetic and science related to the trade. Simple physics, chemisty, metallurgy, heat treatment of metals, and the proper way of making molds and cores is an important part of the training.

In the foundry the training work is carried out in a place set apart. A special instructor is employed by the firm whose sole object is to give the apprentice a thorough, practical and intensive training on actual every day work, and to teach the apprentice all the steps of molding and coremaking. Thus, skill and knowledge of shop procedure is obtained by actual work in the foundry. The proper selection of materials, equipment, melting and mixing metals and sands, setting up and handling the flasks, also the use of overhead cranes, the operation of sand blast for cleaning is taught. It will be seen how necessary it is that a molder must have practical as well as theoretical training that he may carry on his work.

The question often is asked "At what age should a boy be put to work in the foundry?" This is an important question and is best answered in the following way: Since the work of the molder is quite heavy, it is not advisable for a boy to attempt to learn this trade at too early an age. If a boy of 16 has good average physical development he may enter the trade where he is taught as described in the foregoing, but if his physical development is not up to standard, it is better to wait a year or even two. If the boy enters a shop where there is no instruction course or training shop it is better to wait until he is 18 years of age. The boy should be strong physically, quick and active in his movements. A boy with an aptitude for *making things* usually succeeds in molding and coremaking. Mechanical aptitude and ingenuity with an accurate turn of mind carry a boy a long way in this trade. Molding brings out individuality as few other trades do. It promotes in men



WHILE in popular conception, the foundry is dirty, modern equipment and methods have removed much of the grime. In many shops, the highest type of locker and washrooms are provided. Note the cleanly sandblast room.

the ability to direct and handle men. A man in this field with leadership and ability will be a success.

A word should be said as to the obligations of the apprentice to the employer and *vice-versa*. An agreement or indenture is signed by three parties, the employer, the parent or guardian, and the youth, who is to become an apprentice. The employer agrees to take the apprentice into his plant for a period set forth in the indenture and give him a training in his trade, paying him a predetermined wage as set out in the indenture. This training entails much expense on the part of the employer from which he gets little if any return for the first 12 months. In most cases the apprentice is a loss to the firm for this period.

The apprentice agrees to bind himself to the employer to serve an apprenticeship of a certain duration, for a certain wage as set forth in the indenture, and in honor and fairness to the employer should complete the full course decided upon. When the apprenticeship is complete the boy becomes a journeyman. He may then rise to become foreman or superintendent. Often the chief executive of a plant has started life on the foundry floor.

A boy with two years in high school is better equipped from an educational point of view than a boy with only a grammar school education, but it must be remembered that a boy should not be older than 18 years when he becomes a regular apprentice. The high school boy has a better background, but it is not every boy who can afford the time to go to high school. Therefore, he should make the best of his time at school until he is 16.

It is the writer's wish to impress upon the boy the advantages of a practical education, the advantages of learning a trade, the importance of being a producer and a real cog in the wheel of life and progress. Reach this objective by stages, do not try to leap to the top of the ladder in one jump. It is better to make many small successes than to make one big success and then meet a reverse.

Early Training Necessary

Another serious consideration, but one which we cannot expect youth to realize to the full extent, is that the skilled workman can be produced only by training, and in this training he is taking out insurance for himself and those who may be dependent upon him in middle age. A man of 50 should be useful and valuable, an asset to himself and his country and with a comfortable future, but if he has not learned a trade he often is not wanted and finishes his life in comparative poverty and hardship.

There is one question which will be asked by most parents living in the country districts or small town and it is:

"What will be the living conditions of my son when he goes to the city? How will he meet the different conditions, etc.?"

These are important questions to ask, and they are best answered by the following general statement of facts:

The great metal trades industry depends for its future on the American boy, and the boy who is going to form our best material for these trades will come from the country districts and small towns, because the industry demands a higher class youth than usually offers himself in the large cities. The physical standard must be higher and the intellect and morale of better quality if progress and prosperity are to be maintained. Leaders in industry are beginning to appreciate that this great keystone, the foundry industry, must be controlled by those who believe and practice American principles. To bring this about we must induce the right kind and type of boy to take up apprenticeship in the foundry.

Get Small Town Boys

It also is appreciated that if there is to be an influx of youth from the country districts to the city to make up the shortage from which we now suffer at intervals, we must be prepared to take care of these boys, to guide them and help them in their start in life. They need friends and advisors, their well-being in every way must be taken care of, they must be properly fed and lodged, their health and recreation must have attention. At present organizations in most cities make it their business to take care of boys away from home. These organizations are sponsored by the business men and industrial leaders of the city, whose object is to guide the youth, to see that he has comfort, pleasure and guidance. Great expansion is being made along these lines, and parents need not fear sending their boys to any reputable firm to learn a trade. Men of repute and high standing are interested, and the youth is developed by contact with such men and their aspirations.

The motive of this movement is to induce boys to learn to work at something worth while, that they may become producers, good citizens, and useful units in the workaday world and in social life. The objective is three fold in its inception. It is national, industrial, and individual. The nation must have workers to be prosperous. Industry demands skilled workers to progress. The individual worker must have skill to be a useful unit in life.

Melt Iron In Crucible

Question: Occasionally we have orders for small quantities of gray iron castings and will greatly appreciate any information you can give us on how to go about melting this metal in small oil fired pit furnaces regularly employed for melting brass.

Answer: With the single exception that the process will take a little longer you will experience no more trouble in melting gray iron in your crucible furnace than in melting brass. Clean stoveplate scrap probably will meet your requirements better than any other class of raw material. These castings originally are made from a good quality of iron. They expose a larger surface to the heat and thus facilitate melting and they easily are broken into small pieces so that they may be packed in a fairly compact mass in the crucible. Care must be observed not to pack them too tightly, otherwise the expansion may crack the pot. To avoid this contingency and also to expedite the melting it is considered good practice to interpose a layer of charcoal between alternate 3 or 4-inch layers of iron. Crucible makers supply a special pot for melting steel and you probably would get better satisfaction by keeping one of these pots on hand and using it for special gray iron heats than by using one of your regular brass pots.

Cast Chapel Bells

Chimes for the George Washington memorial chapel at Valley Forge, Pa., have been cast recently by the Meneeley Brass Co., Watervliet, N. Y. The chimes which are the gift of the Daughters of the American Revolution, from the 13 original states, will be housed in a tower of the chapel which marks the locality where Washington's army suffered almost unendurable hardship. The chimes consist of 14 bells and weigh more than 20 tons. Meneely company is one of the oldest bell founders in America and is observing its hundredth anniversary.

Testing Society Shows Trend of Times in Metal Products

MUCH of what is termed modern practice in manufacturing and industry has emerged from a great multiplicity of effort expended by engineers, scientists and practical men. Tried under stringent demands of present day production, only the fit survive. A large measure of credit for the survival of that which is best is due to organizations such as the American Society for Testing Materials, which held its twenty-ninth annual meeting in Atlantic City during the week of June 21. American manufacturing practice today owes much to this association, for its work in developing methods of testing, for its research on the properties of engineering materials and for sponsoring specifications which are accepted as standard.

The 1926 meeting was featured by a number of new developments of interest to the foundry and metalworking industries. Valuable data were contributed on methods of testing cast iron pipe. A comparison of test bars gives further light on means for determining the relative quality of cast iron. A paper by a British author gives valuable information on aluminum casting alloys used abroad. New specifications are offered for nonferrous castings. Recent developments reported in magnetic analysis, radiography and the effect of repeated and reversed stresses may have an influence upon future foundry practice.

Scrutinize Various Forms of Testing

ONE noteworthy feature which probably will mark the twenty-ninth annual meeting of the American Society of Testing Materials as memorial was the presentation of a series of reports and papers dealing with the practical application of magnetic analysis to testing and inspecting of steel. Frank P. Fahy, consulting engineer, New York, chairman of the committee which has had this investigation in charge reviewed the work which has been done since this problem was brought under consideration in 1918. Mr. Fahy introduced Thomas Spooner, research engineer, Westinghouse Research Laboratory, East Pittsburgh, Pa., who gave a comprehensive paper outlining the results of a magnetic analysis on about 150 pounds of ½-inch square, high speed steel.

In this paper, Mr. Spooner shows conclusively that the magnetic characteristics provide a sensitive measure for determining the response or lack of response of material to a heat-treatment process. His study covers a range of quenching temperatures from 2100 to 2400 degrees Fahr. and drawing temperatures to 1150 degrees Fahr. In the discussion which followed, the work of Mr. Spooner and of the committee under Mr. Fahy was warmly commended. It was stated that the magnetic method of testing makes it possible to inspect materials of this nature, notably tool steel or small tools and to determine accurately the previous method of quenching and drawing, making a definite inspection without destroying or in any way injuring the materials tested.

Consideration is being given to the possibility of determining blowholes in large steel castings by the method of magnetic analysis. This is said to be possible where large defects of this nature exist, but where the blowholes constitute only a small portion of the volume, success is held in doubt.

Prof. A. N. Talbot, University of Illinois, Urbana, Ill., presented a complete paper on tests of cast-iron pipe. This was prepared from data secured by Prof. Talbot and F. E. Richart, and covered 25 lots of 6-inch cast iron pipe made by standard methods of sand casting, or by pouring into two types centrifugal molds, the latter being metal and refractory material, respectively. A comparison between the products given by the three methods may be made from the tabular data submitted, although the point was stressed that the paper dealt with methods of tests rather than with comparative properties of the pipe tested. Prof. Talbot stated that the internal pressure test is a searching test, but that the ordinary proof pressure gives relatively little information. He believes that auxiliary test specimens for determining strength and stiffness qualities will give important information in judging quality of output. He recommends test strips cut from the pipe uniformly ½-inch in thickness and with a width covering the full thickness of the wall of the pipe, 12 inches long with a load applied equally at the one-third points of a 10-inch span.

In discussing this paper, J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala., recommended the use of special test strips. He stated that ability to bend is more important in pipe than ability to resist bending and for this reason, resilience is a valuable property.

Thomas H. Wiggin, consulting engineer, New York, raised the question

(*Concluded on Page* 547)

New Officers

AMERICAN SOCIETY FOR TESTING MATERIALS

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J. H. GIBBONEY
Chief chemist, Norfolk & Western Railway Co., Roanoke, Va.

Vice President

G. W. THOMPSON
Chief chemist, National Lead Co., Brooklyn, N. Y.

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Consulting engineer, New York.

W. F. EDWARDS
Director of research, United States Testing Co., Inc., New York.

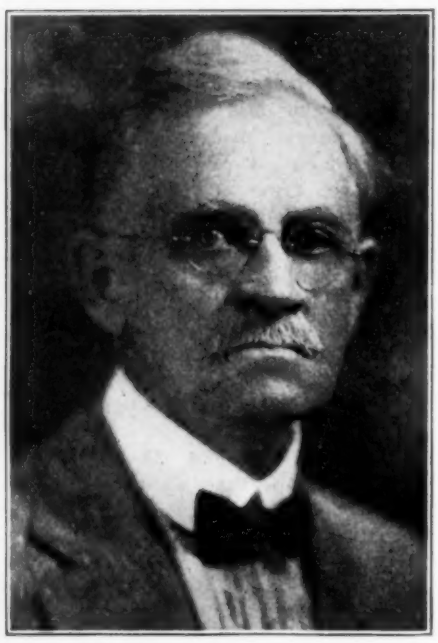
W. B. PRICE
Chief chemist, Scovill Mfg. Co., Waterbury, Conn.

H. T. SHELLEY
Manager, Eastern Clay Products association, Philadelphia.

A. S. T. M. Elects New Officers

JAMES H. GIBBONEY
(Above)

ELECTED president of the American Society for Testing Materials, is chief chemist for the Norfolk & Western Railway Co., Roanoke, Va. He was graduated from the Virginia Polytechnic institute in 1901 and immediately became connected with the teaching and engineering experiment station staff of that institution. In 1906 he joined the Norfolk & Western. He has been active in the field of testing materials for the past 20 years, and has served on research and specification committees of the American Society for Testing Materials, the American Railway Engineering association, American Society for Steel Treating, and the American Wood Preservers' association. For the past five years he has been chairman of committee A-5 on corrosion of iron and steel.



WILLIAM B. PRICE
(Below)

A NEW member of the executive committee of the American Society for Testing Materials, is chief metallurgist of the Scovill Mfg. Co., Waterbury, Conn. He was born in New Haven, Conn., was graduated in chemistry at Sheffield Scientific school, Yale university, in 1902, immediately becoming connected with the Scovill Mfg. Co. He is a member of the American Institute of Mining & Metallurgical Engineers, American Society for Testing Materials, American Chemical society, American Electro-Chemical society, and the British Institute of Metals. He is past president of the American Institute of Metals, past chairman of sub-committee IX on nomenclature and is president of subcommitee III for the international standardization of zinc, chairman of subcommittee on wrought brasses and bronzes of the

Society of American Engineers, and a member of the ordnance department metallurgical advisory board.

CLOYD M. CHAPMAN
(Right)

MADE a member of the executive committee of the American Society for Testing Materials, was born at Akron, O., in 1874, and was educated at Cornell university. He left that university in his senior year and served as an ensign in the navy, engineering department, during the Spanish-American war. He was employed as assistant to Thos. Edison, West Orange, N. J., from 1899 to 1905. He has been connected with Westinghouse, Church, Kerr & Co. from 1905 to 1920 as engineer in charge of design and construction of power stations and manufacturing plants. Since 1920 he has been engaged in consulting engineering practice in New York. He is a member of the American Society for Testing Materials, the American Society of Mechanical Engineers, the American Concrete Institute, the American Chemical Society and Edison Pioneers.

WILLIAM F. EDWARDS
(Left)

WHO was elected a member of the executive committee of the American Society for Testing Materials, is director of the laboratories, U. S. Testing Co. Inc., New York. He is chairman of committee D-13, the textile division of the American Society for Testing Materials, and is a member of the American Chemical society, British Society of Chemical Industry, American Electro-Chemical society, American Society for Steel Treating and the American Association Textile Chemists and Colorists.

GUSTAVE W. THOMPSON
(Above)

NEW vice president of the American Society for Testing Materials, was born July 27, 1865. He became chief chemist of the National Lead Co. in 1892 and director in 1916. He was director of the Williams-Harvey Corp. in 1917 and vice president in 1919. In 1917 he was made a director of Williams-Harvey Co., Ltd., London, England, and in 1920 a director of the Titanium Pigment Co. In 1923 Mr. Thompson was made a director of the United Lead Co. and in 1925 was made director and treasurer of the Metallurgical & Chemical Corp. He was president of the American Institute of Chemical Engineers in 1918 and is a member of the American Chemical society, Society of Chemical Industries, American Society for Testing Materials, Chemists club, New York, and Chemical Verein.

(*Concluded from Page* 545)

of whether the testing of a standard bar poured from pipe metal is not a test of a test bar, rather than a measure of the quality to be expected in the pipe. He stated that practically all tests of cast iron pipe require the destruction of the pipe itself, and inferred that a lack of uniformity in the lot tested might result in unreliable test results, since the specimen selected might be off standard. He called attention to recommended tests of iron castings wherein exceptionally small test pieces are removed and advised a study to see whether some test piece sufficiently small to permit tapping and plugging the pipe where the specimen is removed, might not be found. At present many pipe are lost through breakage in handling. This loss in some cases runs as high as 15 per cent and may be ascribed to faulty foundry practice, resulting from removing the pipe from the mold while the temperature is too high.

J. T. MacKenzie, in a paper presenting the results of comparative tests on a large number of bars made from identical metal mixtures, compared the two existing standard test bars for cast iron with a new bar proposed by the committee of the American Foundrymen's association. The first two mentioned are the so-called standard bar, of rectangular section 1 x 2 inches, 26 inches long and broken by a load at the center, while supported on knife edges 24 inches apart; the arbitration bar, round 1.25 inches in diameter, 15 inches long and broken on 12-inch centers. The new bar is 1.2 inches in diameter, round section, 20 inches long and broken on supports placed 18 inches apart. All the bars made by Mr. MacKenzie were poured in sand molds, one to a flask, the mold blacked with care to assure a surface free from sand and cast on end. A definite relation was found between the strength and the factor represented as follows:

$$\frac{1}{\frac{C \times Si}{3}}$$

That is, the strength varied in inverse proportion to the total carbon multiplied by 1/3 the silicon. The author stated that the new bar gives the best results both in the load and deflection tests.

An announcement of the election of officers as accomplished by letter ballot, was made as shown in the accompanying box.

W. H. Fulweiler, United Gas Improvement Co., New York, and president of the American Society of Testing Materials in a scholarly address delivered at the evening session, Tuesday, directed attention to the importance of little things in standardized methods of testing. He stated that the two main functions of the society are to establish methods of testing and to provide specifications for materials and of these the former is the more important. He urged particularly that test apparatus should be specifically described, warning of the danger of leaving details to the judgment of individuals, since by such action uniformity or comparison of results is impossible.

H. F. Moore, University of Illinois, Urbana, Ill., presented the report of the committee on the correlation of research. This committee has for its purpose the compilation of information on research being conducted by various technical bodies, it acts as a clearing house for information of mutual importance, and suggests the studies of those properties of materials about which information is needed.

J. A. Capp, General Electric Co., Schenectady, N. Y., chairman of the committee on methods of testing reported the work accomplished upon the following lines: mechanical testing, impact testing, volatility, plasticity and consistency, determination of water, size and shape, and methods for determining density.

Recognize Service

AN UNUSUAL recognition of long service was accorded to Richard Moldenke, Watchung, N. J., and Walter Wood, R. D. Wood & Co., Philadephia, when committe A-3 on cast iron elected Dr. Moldenke honorary chairman and Walter Wood honorary vice chairman of the committee. Walter Wood served as chairman of this important committee from its organization in 1903 *until* 1911 *when action of the society made it imperative that someone other than a producer should head each committee. At that time Dr. Moldenke was chosen chairman and held office continuously until the recent meeting. The new active officers of this committee are as follows: R. S. MacPherran, Allis Chalmers Mfg. Co., Milwaukee, chairman; Hyman Bornstein, Deere & Co., Moline, Ill., secretary; E. J. Lowry, Hickman, Williams & Co., Chicago, vice chairman.*

Consider Desirable Steel Properties

A SESSION devoted to the consideration of rolled and fabricated steel, and outlining tests upon structural steel was held Wednesday morning, June 23. J. H. Gibboney, president-elect of the society, and for many years chairman of the committee on steel, presided.

In presenting the report of this committee, F. M. Waring, engineer of tests, Pennsylvania Railroad system, Altoona, Pa., chairman, presented a number of revisions in existing standards for railway and automotive rolled and fabricated materials.

Chairman George K. Burgess, director, bureau of standards, Washington, offered a report of the joint committee on the investigation of the effect of phosphorus and sulphur in steel, which gave definite conclusions from an exhaustive series of tests on rivet steel of the following limits: Carbon, 0.09 to 0.15; manganese, 0.35 to 0.64; phosphorus, 0.005 to 0.035; silicon, 0.002 to 0.057; and sulphur from 0.04 to 0.18 per cent.

Within the range of the analyses given, and the committee particularly stressed this limitation, shows that sulphur present in commercial rivet steel up to at least 0.06 per cent is not detrimental. Above this point, the value of the following properties decrease with the increase in sulphur content. Percentage of elongation and reduction of area for material tested perpendicular to the direction of rolling, in the natural, annealed and quenched condition. The Charpy and Izod impact tests for all three conditions of the material tested parallel and perpendicular to the direction of rolling.

An interesting paper by S. H. Ingberg and P. D. Sale, bureau of standards, Washington, outlined the result of tests on typical rolled steel shapes and one hollow cast iron structural member. These were designed to show the weakening in such materials in buildings undergoing fires.

The closing paper of the steel session, presented by J. R. Dawson,

Union Carbide & Carbon Research Laboratories Inc., New York, an interesting series of tests on welds on ⅜-inch plate, were described and the results offered. Using the oxyacetylene methods, a series of plates, developing from 52,000 to 58,000 pounds per square inch tensile strength were welded together, using the double V-type joint and employing commercial steel rods of 0.20 carbon, and with manganese and silicon high. The welded plates were cut in strips, perpendicular to the line of welding and these test pieces developed a strength averaging 40 per cent stronger than the plates.

The first Edgar Marburg lecture, established through popular subscription among the members, in memory of the first secretary of the society, was presented Wednesday afternoon by Arthur N. Talbot, University of Illinois, Urbana, Ill., past president and honorary member. The subject was, "Research and Reinforced Concrete as an Engineering Material."

Offer New Nonferrous Specifications

WILLIAM CAMPBELL, metallurgist, New York navy yard and professor of metallurgy, Columbia university, New York, presided at the session devoted to the consideration of nonferrous metals and metallography. This session, held Thursday night, was exceptionally well attended by producers and users of nonferrous metals and by metallurgists of national recognition.

The report of the committee on copper wire was presented by J. A. Capp, General Electric Co., Schenectady, chairman, who called attention to minor changes in existing specifications, notably the substitution of density for specific gravity as the unit of weight for measuring this material. Dean Harvey, Westinghouse Electric & Mfg. Co., East Pittsburgh, as chairman submitted a tentative method of testing resistivity of metallic materials for electric heating.

Chairman William Campbell, presented the report of the committee on nonferrous metals and alloys, involving proposed new tentative specifications for aluminum bronze casting; sand casting of the alloy containing copper, 88, tin 8, zinc, 4 per cent, for steam and valve bronze sand castings; and for composition brass or ounce metal sand castings. This committee also submitted methods for determining aluminum in small quantities both for close accurate work and for control. Further, new tentative specifications for aluminum base, sand casting alloy ingots and for aluminum for use in the manufacture of iron and steel, the latter to be advanced to standard were offered.

Two interesting papers on aluminum were offered at this session. The first, on mechanical properties of duralumin sheet as affected by heat treatment by Robert J. Anderson, Cleveland, was read by title while the second on aluminum casting alloys as used in Great Britain, by George Mortimer, William Mills, Ltd., Birmingham, England, was read by E. V. Pannell, British Aluminium Co. Ltd., New York.

In the latter paper abstracted on page 564 of this issue, the various standard casting alloys of aluminum as used under British requirements are the common casting alloys known as 2L5, with the following analysis; aluminum, 84, zinc, 13 and copper 3 per cent; the alloy 3LII consisting of aluminum, 92, copper 7, and zinc, 1 per cent; and the mixture commonly used for casting pistons, which is aluminum 88, and copper, 12 per cent. Of these alloys, the first, 2L5 ranges in tensile strength from 24,000 to 35,000 pounds per square inch with an elongation from 3 to 8 per cent. The 3LII series ranges from 20,000 to 29,000 pounds with 3 to 5 per cent elongation and the 2L8 from 20,000 to 26,000 pounds per square inch and an elongation of 0 to 1.5 per cent.The author calls attention to the different methods used abroad in making test bars.

This paper developed an interesting discussion, led by Zay Jeffries, consulting metallurgist, Aluminum Co. of America, Cleveland. Dr. Jeffries stated that in pouring test pieces in chilled molds exceptional conditions are set up that are not matched in the castings poured from the same metal, due to the differing chill effects. He said that in this country the 3LII mixture poured in sand molds for test bars, according to American practice, would give only about 18,000 pounds tensile with 1 per cent elongation. The 2L5 mixture under similar conditions would give about 25,000 pounds with 2.5 per cent elongation. This mixture which machines readily and is relatively cheap is favored for castings like crankcases. These three alloys are essentially casting products, and are not advisable where high ductility is required. Dr. Jeffries referred to a third alloy mentioned by the author, containing aluminum 92.5, copper 4, nickel 2 and magnesium 1.5 as a mixture of considerably higher cost, applicable more to forging, casting in permanent molds and for other fabrication purposes. This alloy is capable of developing as high as 49,000 pounds per square inch tensile strength under special heat treatment.

N. K. B. Patch, Lumen Bearing Co., Buffalo, remarked upon the British test bar as a comparative measure of metal rather than as any indicating factor in the castings poured from identical metal.

The committee on metallography of which H. C. Boynton, John A. Roebling's Sons Co., Trenton, N. J. is chairman, presented a series of etching solutions for preparing specimens of various steels, recommended a glossary of terms relating to radiography, and gave a tentative recommended practice for radiographic testing of metal castings. Recommended practice for the care of the eyes also was presented.

Corrosion and Fatigue

J. H. GIBBONEY, Norfolk & Western Railway Co., Roanoke, Va., chairman of committee on the corrosion of iron and steel, presented the report of that committee at the opening of the session, Thursday, June 24. This outlines in detail the progress of various long-time tests on iron and steel sheets which have been exposed to the corrosive action.

A paper by T. H. Nelson, William H. Bate, Sons & Co., Conshohocken, Pa., outlined the conditions existing in the application of chromium alloys of iron and steel. The author deprecated the tendency to stretch the application of the various patented alloys of this group to cover conditions which normally cannot be met, and stated that decidedly different properties are encountered depending upon the percentage of chromium carried.

D. J. McAdam Jr., U. S. naval experiment station, Annapolis, Md., presented an interesting paper showing a new phase of the fatigue effect on metals subjected to repeated stress.

He presented evidence to show that when slight corrosion exists, such as may be visible only under microscopic examination, in test pieces subjected to fatigue, the resistance of the material is lowered. In steel the damaging effect of corrosion is increased as the steel is harder. Various samples of carbon and alloy steel, ingot iron and monel metal were tested and the breakage or point of failure, shown under the microscope appeared at the various points in the specimen attacked by corrosion.

Papers by R. R. Moore, McCook Field, Dayton, O., on the effect of grooves, threads and corrosion on fatigue, and by P. L. Irwin, on the fatigue of metals by direct stress, completed the session.

Malleable Refractories

THE general committee of the society devoted to the study of tests and specifications for refractories and headed by W. H. Fulweiler, United Gas Improvement Co., Philadelphia, reported on a survey on refractories for open-hearth furnace use, and reviewed the co-operative work which has been done on firebrick by a number of interested agencies. Approval was extended for the attachment to this report merely as a matter of interest of the proposed tentative specifications for malleable furnace refractories, including blocks for the sidewalls, bung brick, etc. These were prepared by a joint committee sponsored by the American Ceramic Society, the American Foundrymen's association and other interested organizations of which L. C. Hewitt, Laclede Christy Clay Products Co., St. Louis, is chairman, and J. L. Cummings, S. Obermayer Co., Chicago, is secretary.

These specifications have been influenced in a marked degree by data contributed through tests of more than 50 different kinds of refractories, made under direction of M. C. Booze, Mellon Institute of Industrial Research, Pittsburgh.

Local Conditions Govern Cleaning Methods

Question: Can you advise us whether the tendency among the manufacturers of pipe fittings is to clean their castings by sandblasting or by tumbling them in barrels.

Answer: In a general way it may be stated that the almost universal practice among manufacturers of soil pipe and other pipe fittings is to clean castings up to a certain size in tumbling barrels and to apply sandblasting methods to larger castings. This may be due to several causes and does not necessarily prove the superiority of one method over the other. The factor of size, limits the class of castings that may be cleaned by tumbling while the expense incident to the operation of a sandblast usually is the deciding factor in its adoption or nonadoption where castings below a certain size are to be cleaned. Sandblasting equipment has been developed to a high state of perfection in recent years, it has been adopted extensively in large and small installations and is credited with gratifying reductions in cleaning costs as compared with hand cleaning methods formerly in vogue.

On account of their shape, tumbling barrels are particularly adapted to use in cleaning soil pipe and other fittings in a minimum of time. The castings practically clean each other on the outside by rubbing against each other while an excellent opportunity is presented for the stars to clean the inside.

Win Contests

E W. McMULLIN, chemical engineer, Simmons Co., Kenosha, Wis., for the second time won the American Society for Testing Materials championship in golf, and received the championship cup and a gold medal. Other winners in the metals branch of the society include the following: J. J. Howard, E. J. Lavino & Co., Philadelphia and William B. Price, chief chemist and metallurgist, Scovill Mfg. Co., Waterbury, Conn. A. F. Braid, Metal & Thermit Corp., New York, turned in the highest net score. R. J. Shoemaker, Magnus Co., Chicago won the tennis tournament.

To Reduce Varieties

Representatives from companies manufacturing approximately 90 per cent of radiators produced in this country held a meeting under the auspices of the division of simplified practice at the department of commerce, Washington, June 17. The meeting was called to reduce the variety of radiators in heating equipment, and a motion was adopted requesting the National Boiler and Radiator Manufacturers' association to conduct a survey of the existing variety. From the results of this survey a tentative simplified practice recommendation will be prepared to be submitted to interested parties.

The meeting was presided over by E. E. Ely, assistant director of the committee on metals utilization. The following representatives of manufacturers were present: Sherwood C. Bliss, Richmond Radiator Co., New York; R. C. Bolsinger, Fowler & Wolf Mfg. Co., Philadelphia; George C. Boose, Gurney Heater Mfg. Co., Boston; John S. Burke, Logansport Radiator & Equipment Co., Logansport, Ind.; Thomas S. Burke, United States Radiator Corp., Washington; W. B. Gifford Jr., American Radiator Co., Washington; Henry B. Gombers, secretary, Heating and Piping Contractors National association, New York; Charles W. Wood, Union Radiator Co., Johnstown, Pa.; Charles P. Hackett, United States Radiator Corp., Philadelphia; Walter J. Jacob, National Radiator Co., Washington; H. E. Longwell, Pierce, Butler & Pierce Mfg. Corp., New York; M. F. Moore, Kewanee Boiler Co., Kewanee, Ill.; W. C. Murray, Lincoln Radiator Corp., Utica, N. Y.; J. J. Smith, Republic Boiler & Radiator Co., Washington; George N. Thompson, building code committee, department of commerce, Washingon; W. W. Wetmore, Niagara Radiator & Boiler Co., Buffalo.

Committee Nominates A. F. A. Officers

The nominating committee of the American Foundrymen's association recently met in Detroit and unanimously nominated the following as officers and directors of the association:

President, S. W. Utley, vice president and general manager, Detroit Steel Casting Co., Detroit.

Vice president, S. T. Johnston, vice president, S. Obermayer Co., Chicago.

Directors to serve three year terms each, Martin W. Henley, vice president, Frazer & Jones, Syracuse, N. Y.; N. K. B. Patch, secretary and works manager, Lumen Bearing Co., Buffalo; A. B. Root Jr., mechanical engineer, Hunt-Spiller Mfg. Corp., Boston; S. C. Vessy, president, W. W. Sly Mfg. Co., Cleveland; L. C. Wilson, vice president and general manager, Federal Malleable Co., West Allis, Wis.

The nominating committee consisted of the following: C. R. Messinger, chairman, G. H. Clamer, L. W. Olson, P. T. Bancroft, L. S. Murphy, Charles Suess and E. S. Van Dalson.

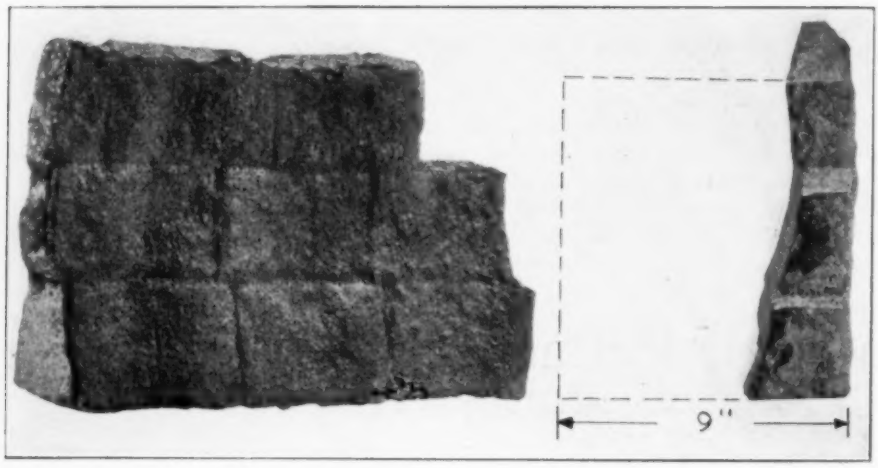


Fig. 1—Inner face of wall showing wear of brick

Fig 2—End view when wall had worn back to 1½ inch thick

Getting Double Duty from Fire Brick

By H. M. Thompson

AN EXAMPLE of the use of crushed old fire brick as a ganister for furnace and maintenance and for making special tile is being demonstrated in an oil burning furnace for making tie plates at the plant of the Sellers Mfg. Co., Mayfair, Ill. Considerable trouble had been experienced with fire clay joints between the high grade fire brick in this furnace because the fire clay burned out and shortened the life of the brick. Now the fire brick is laid up with a mortar made of a mixture of high temperature cement and crushed old fire brick (150 mesh) using 60 per cent of the crushed brick to 40 per cent of the cement. In using this mortar, joints are made not to exceed ⅛-inch thick.

The furnace measures 38 feet long, 8 feet wide and 5 feet high and has a hearth of silica sand. The oil is fired through three burners. Five charging doors are provided for feeding the material into the furnace in the usual form of boxes made of scrap iron and steel, tied together and brought to a welding heat.

The inner side wall linings are laid up of 9-inch thick, all brick being 9-inch header courses. The furnace is operated until these brick are burned back to 1½-inch thick before they are rebuilt. Figs. 1 and 2 show samples of the burned out brick work and clearly indicate that the joint stands up as well as the brick and that the whole lining burns down uniformly.

In Fig. 2, which shows a sectional view of the burned out lining, the thinnest section is about 1½-inch thick and the bottom of the section is about 3 inches thick, which is the slag line. The company's operating records show that the walls when laid up with a mortar of finely ground old fire brick mixed with high temperature cement lasted 12 weeks, as against five when bonded with clay.

In this same furnace, burner blocks of crushed old fire brick bonded with high tempreature cement have shown a considerable saving in first cost. In making the burner blocks, the old fire brick is taken from the company's furnaces and dumped into a ball mill which has a capacity of 5 tons per hour, and requires little attention.

Wood molds for these blocks cost $5.00 and a great many blocks have been made from a single set of molds. The set of blocks illustrated in Fig. 3 is composed of four sections and measure when assembled, 24 x 24 x 9 inches thick.

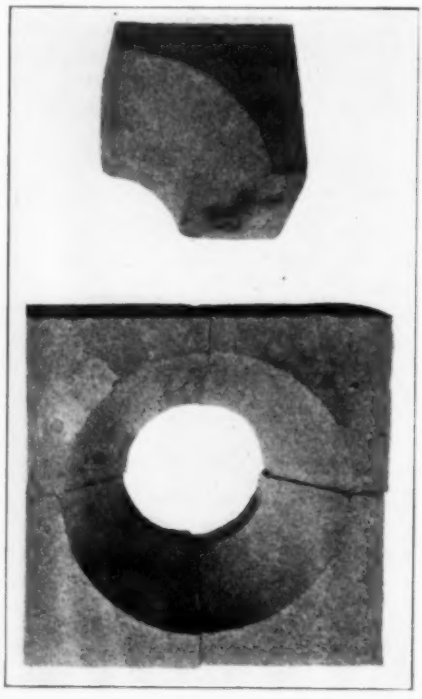


FIG. 3—BURNER BLOCKS MADE FROM CRUSHED FIRE BRICK

The old fire brick is reduced in the ball mill to ⅛ inch, including all fines down to 250 mesh. The high temperature cement is diluted in a mortar box to the consistency of a pancake batter, and the crushed fire brick is gradually added and thoroughly mixed until it is just moist enough to bond. The relative quantities are 25 per cent cement to 75 per cent crushed fire brick.

The mixed material is then placed in the molds, firmly tamped and allowed to set for two or three hours after which the molds are removed. The blocks are then allowed to stand ten days to thoroughly air-set. They can then be handled without danger of fracture. When set in the furnace at the burner ports heat can be applied at once.

Castings Warp Down and Up While Cooling

Question: We are enclosing blue print of a pattern for a side bar for a stationary grate. The castings are made in lengths between 56½ and 120 inches and we find that the castings warp out of shape, but not always in the same manner. Sometimes they buckle up and at other times they pull in the opposite direction. The patterns are straight and there is nothing in the design to cause undue contraction at any one point. This is indicated by the fact that the longer castings do not warp. All our trouble is confined to lengths between 56½ and 83 inches. We have verified the straightness of the cope and drag with a straight edge before closing

Payment will be made for all contributions on foundry and pattern shop practice suitable for publication

Note—This sheet may be cut into two sections, 5 x 7 inches, and may be readily bound in notebook form.

Patternshop Geometry

By Walter C. Ewalt

(Continued from Data Sheet No. 628)

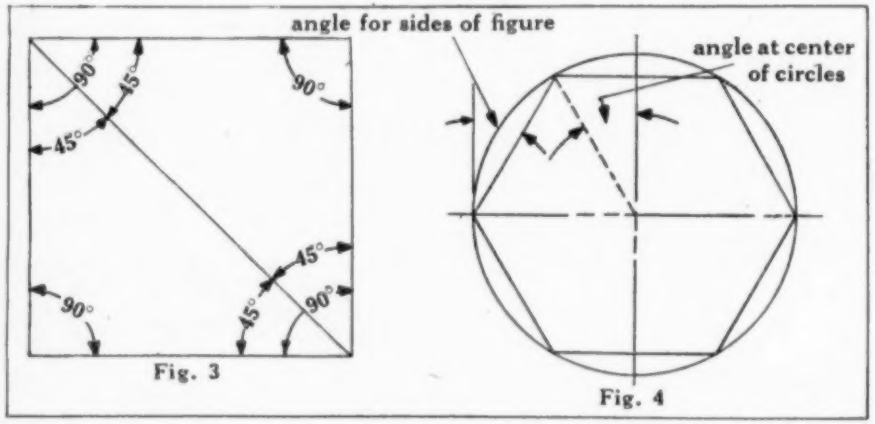


FIG. 3—THE ANGLES OF A SQUARE EQUAL 360 DEGREES AND THOSE OF A TRIANGLE 180 DEGREES. FIG. 4—ILLUSTRATING THE TERMS USED IN TABLE II

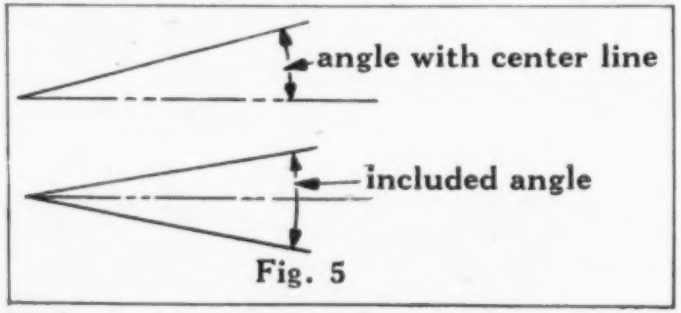


FIG. 5—TAPER MAY REFER TO THE ANGLE WITH THE CENTER LINE OR TO THE INCLUDED ANGLE. TABLE III GIVES COMMON TAPERS AND THE CORRESPONDING ANGLES

(Concluded on Data Sheet No. 630)

Patternshop Geometry

(Concluded from Data Sheet No. 629)

TABLE II

Table for Dividing Circles or Laying Out Geometrical Figures

No. of Sides	Included Angle	Angles at Center of Circles	Angles for Sides of Figures
3	120°	30°	30°
4	90°	45°	45°
5	72	18°—54°	36°—72°
6	60°	30°	30°
8	45°	45°	22° 30′
10	36°	54°—18°	18°—54°
12	30°	60°	15°—45°
14	25° 43′	60° 17′—38° 34′—12° 51′	12° 51′—38° 34′—64° 17′
16	22° 30′	67° 30′—45°	11° 15′—33° 45′
18	20°	70°—50°—30°—10°	10°—30°—50°—70°
20	18°	72°—54°	9°—27°—45°
24	15°	75°—60°—45°	7° 30′—22° 30′—37° 30′

TABLE III

Tapers per Foot and Corresponding Angles

Taper per Foot Inches	Included Angle	Angle with Center Line	Taper per Foot Inches	Included Angle	Angle with Center Line
1/8	0° 36′	0° 18′	1	4° 46′	2° 23′
1/4	1° 12′	0° 36′	1 1/8	7° 09′	3° 35′
3/8	1° 30′	0° 45′	1 1/4	8° 20′	4° 10′
1/2	1° 47′	0° 54′	2	9° 31′	4° 46′
5/8	2° 05′	1° 02	2 1/2	11° 54′	5° 57′
3/4	2° 23′	1° 12′	3	14° 15′	7° 08′
7/8	3° 35′	1° 47′	3 1/2	16° 36′	8° 18′
1	4° 28′	2° 14	4	18° 55′	9° 28′

Around the World with The Foundry

Little Journeys to the homes of our readers

Tasmania

ENLIGHTENED public sentiment, many years ago caused the repeal of English statutes under which men guilty of minor offences, or, guilty of exercising what now are recognized as the rights of free men, could be herded with criminals who had committed the most heinous crimes, chained for six months in the holds of convict ships on the leisurely and lonely journey more than half way around the globe, to spend the remainder of their lives in what probably was the most notorious penal settlement in the world, Botany Bay, Van Diemen's Land.

In the seventy years that have elapsed since the last of the ships bearing Her Britannic Majesty's broad arrow spewed her unfortunate cargo ashore, the island has attracted voluntary emigration, mostly from the British Isles until now the population numbers over 200,000.

Agriculture and stock raising are the principal industries, but deposits of gold, silver, tin and coal are developed to a considerable extent and the local foundries are quite competent to handle all the necessary demands made in that line. Foundry practice is on a par with that in the British Isles where most of the proprietors learned the business and where they also learned to appreciate the value of THE FOUNDRY, the world's acknowledged authority on all phases pertaining to the casting of metals.

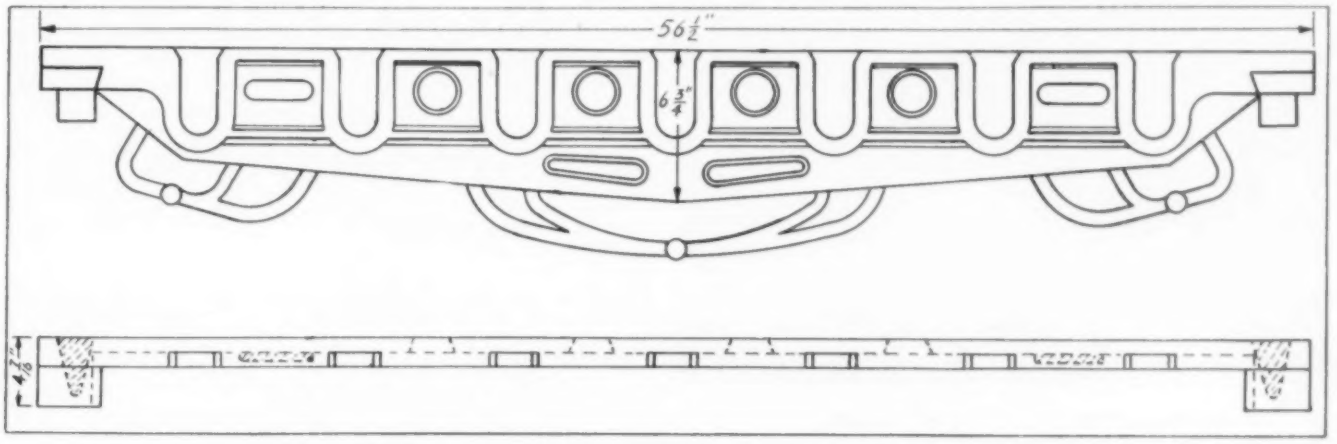
"Wherever metals are cast you'll find THE FOUNDRY"

the mold. We have tried pouring the castings two-up at each end also one-up at each end with a third gate near the center as shown in the sketch, but still the castings come crooked. The most peculiar feature in connection with the problem is that occasionally all the castings poured from a heat will come straight, while more frequently 40 per cent will be warped and the remainder straight. We have poured the castings with iron at various temperatures but apparently this factor is not responsible for the trouble. We shall appreciate your opinion on this subject.

Answer: You have eliminated all the possible contributory factors with the exception of one. We are inclined to the opinion that the manner in which the castings are shaken out is responsible for the trouble. You have omitted any reference to this detail and we do not know whether the omission is intentional or not. If the castings are stripped while they are red hot they certainly will warp and the warp will be in the direction of the side that is most exposed. For example, if the copes are thrown off first the ends of the casting will rise. However, if the drag is dumped immediately afterward so that the under side of the casting is exposed, the ends of the castings will pull in the opposite direction.

The fact that the long castings do not warp bears on this theory. In all probability the copes for the shorter bars are shaken out by two men who lift the copes without rapping them and throw them down. This leaves the upper side of the bar exposed to the cooling influence of the atmosphere. The long copes are too heavy to be handled in this manner and therefore they are rapped before they are lifted with the result that all the sand remains on the casting. If *all* the castings warped it might be necessary to leave them in the mold until they cooled, or, an alternative method, they might be shaken out immediately after they are poured and laid on parallel supports so that the air should have equal access all around them. Sometimes where shallow copes are employed warpage is overcome by butting the sand all over, after the casting is poured and then allowing the casting to remain in the clamped flask until it has cooled. This remedy is based on the fact that the heat from the casting radiates through the shallow cope faster than it does through the drag and consequently the upper side of the casting cools first. Butting the sand makes it denser and therefore the heat is retained.

The fact that the greater number of your castings are straight would seem to indicate that the design of the casting is not responsible for the trouble and the same holds true for the temperature of the iron and the manner in which the gates are distributed. We suggest that you check up on your shaking out methods and feel reasonably certain that you will find the cause of your crooked castings there.



THE CASTING IS POURED THROUGH THREE RUNNERS, ONE AT EACH END AND ONE NEAR THE CENTER

Book Review

S. A. E. Handbook, March 1926, published by the Society of Automotive Engineers, New York, leather, 600 pages, 7½ x 4½ inches. Supplied by THE FOUNDRY, Cleveland, for $5.00 net; London, for 25s.

Recommended practices and standards of the Society of Automotive Engineers, for the first time have been published in a bound handbook. Over 500 standards and approved practices including a great number of drawings, tables, charts and forms, occupy the 600 pages of this pocket-size handbook. The contents are divided into sections relating to power plant, lighting, iron and steel specifications, nonferrous metal specifications, etc. These specifications are the cumulative result of standardization work through the co-operative efforts of engineers since the beginning of automotive standardization twenty years ago. Editions of this book will be revised semi-annually. It will be exceedingly valuable to automotive engineers and to those who furnish materials for automobile construction.

Worm-Geared Ladles First Used in 1836

The common worm-geared tilting ladle was first introduced by James Nasmyth at the Bridgewater Foundry in Patricroft near Manchester, England, in 1836. Prior to that time spur geared ladles had been employed and they were the cause of many accidents resulting in severe burns. Nasmyth's ladle was so much safer that he refused to patent the device and it quickly was adopted by nearly all foundrymen in Great Britain.

Nasmyth's name is known the world over on account of his invention of the steam hammer, but relatively few people are aware that he was one of the great foundrymen of the nineteenth century. He built the Bridgewater plant himself and it turned out a great variety of high grade work over a long period of years.

When he was only 17 years old, Nasmyth made brass castings in his own bedroom at night, ramming his patterns gently so as not to arouse the sleeping members of his family who did not approve entirely of his engineering operations. He melted the metal in improvised crucibles in a fireplace with which his bedroom was provided.

Hickman, Williams & Co., Inc., dealers in pig iron, coke and scrap, have moved their New York office from 1548 Equitable building to room 1441 in the same building.

Attaining QUANTITY With QUALITY Improved-II

Fig. 1 (Below)—Clamps Are Adjusted Easily on Cylinder Flasks Through a Small Cam Pulled Up or Down With a Small Steel Bar

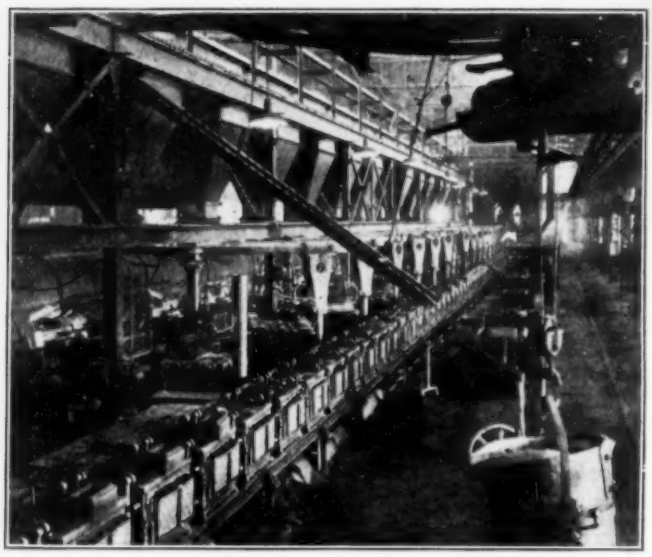


Fig. 2 (Above)—Flexible Unit Where Sand Is Prepared on the Floor and the Molds Are Pushed on a Conveyor

By Arnold Lenz

A WELL equipped pattern shop is an absolute necessity, especially where intricate castings are made. Tool equipment for both wood and metal should include the latest machines developed for this purpose.

Some of the latest additions in labor saving machines for pattern shops are the high speed punches for making templates, filing machines, horizontal grinders with magnetic tables for grinding driers, and the automatic profiling machine on which any number of patterns or core boxes can be accurately reproduced from either wood or metal models. Stripping plates and similar pieces can be produced from sheet metal templates at a great saving of labor. Fig. 8 shows a profiling machine producing a gang core box from a single model.

Due to the excessive wear to which they are subjected metal is the only practical material for production patterns and coreboxes. Double faced matchplates and some of the larger patterns and coreboxes are made of aluminum. For small gate patterns, brass is the standard paterial on account of the ease with which it may be soldered. For large patterns and where great accuracy has to be maintained over a long period, cast iron is the most satisfactory material and therefore is used whenever possible.

The double face aluminum matchplate with vibrators is used extensively for small castings that have to be run intermittently. Changing from one plate to the other is accomplished easily and it can be used on either a bench or a machine. Usually they are used in connection with snap

Fig. 3 (Left)—Heavy Cores Are Assembled and Fitted on Conveyors Which Relieve the Operators of the Weight. Fig. 4 (Right)—Barrel Cores in Two Sizes Are Made on a Pair of Extrusion Machines

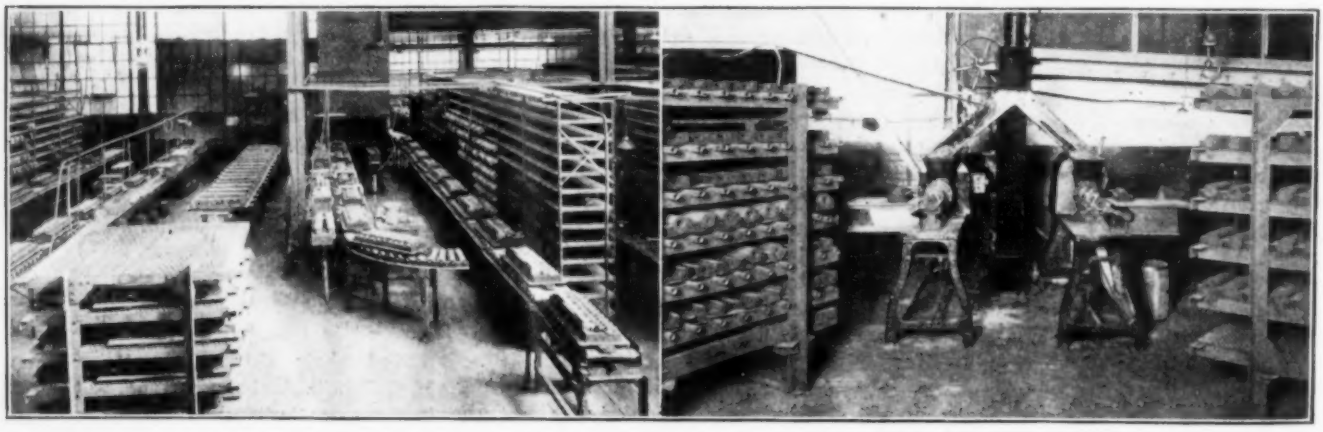


Fig. 5 (Left)—Surface Grinders Are Employed To Secure Accuracy on Jointed Cores

flasks and steel bands, or slip boxes. Castings can be produced accurately by this method because the plates are centered by the flask pins and therefore can be rapped only by a vibrator which does not affect the dimensions of the castings. The match plate adapts itself to either ramming on a bench, or a hand or power squeezer.

For greater quantities, the so-called split pattern plate is to be preferred. By this method, the cope and drag are mounted on separate machines and the combination jolt squeeze stripping type of machine is the fastest for this purpose. The first, or matchplate method requires a molder of considerable training, while the second method comes within the range of laborers of average intelligence who are willing to exert themselves beyond the requirements of ordinary labor.

Cope and drag molds of large castings always are made from two separate plates mounted either on a jolt-roll-over, or a jolt squeeze stripping machine. This practice has become standard, although quite a number of sand slingers are used successfully.

For accurate results, production patterns should be machined all over. Where stripping plates are used, they should be fitted carefully. To assure a minimum of wear on the pattern and stripping plate, also to guard against inaccuracy through worn machines, the stripping plate should be provided with heavy guide pins which move in hardened bushings in the pattern plate.

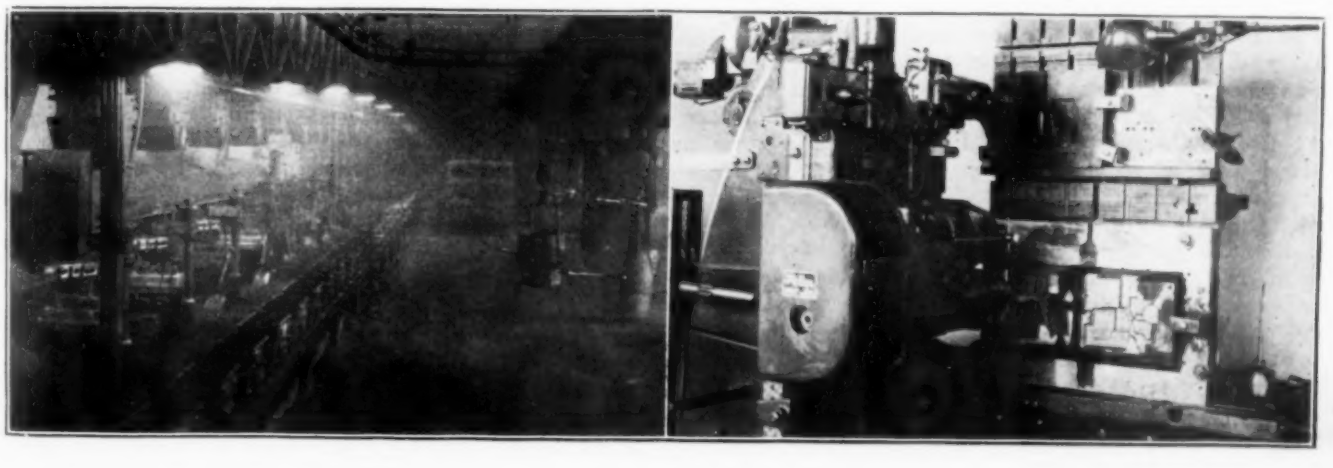
Flask equipment plays an important role in quantity production and has a great influence on the quality of the castings. Flasks should be made of metal with machined joints and accurately fitted closing pins. Flask bars should be designed to eliminate tucking sand under the bars and setting gaggers and nails.

Definite rules can be followed in designing a flask for production work and the jobs are few in which gaggers and nails cannot be eliminated if these rules are followed. For instance, the mold for a certain cylinder block required 78 gaggers and 42 nails. By redesigning the flask, all were eliminated with the exception of 8 nails. Since it also eliminated the tucking of sand under the bars, it can be seen easily that the ramming of the mold was reduced to a simple operation which could be done by any intelligent laborer. Special attention is necessary where hot flasks are rammed on jolt machines. Thoroughly tried rules for barring were described in a paper prepared by the author for the 1923 Convention of the American Foundrymen's association. Some of these rules are illustrated in Fig. 11.

Fig. 6 (Right)—Cores Are Made on Both Sides of a Wide Aisle and Loaded on Racks for Transportation to the Ovens

Fig. 7 (Left)—One of the Molding Units Showing the Machines, the Mold Conveyor, the Sand Supply Chutes and Pouring Equipment. Fig. 8 (Right)—Duplicate Core Boxes Are Reproduced on This Machine

Several methods are practiced for producing castings in the foundry. The molds may be made and set on the



floor during the morning and forepart of the afternoon and shaken out by a night gang who also prepare the sand for the next day.

If continuous pouring is practiced, the molds usually are poured by a pouring gang as fast as they are produced and shaken out as soon as they have cooled sufficiently. This method requires only from 25 to 50 per cent of the flask equipment of the first method and reduces the required floor space by about 15 per cent. This reduced floor space can be cut in two by the use of gravity conveyors arranged as in Fig. 2. This has also the advantage over the second method in that it removes the pouring and shaking out from the immediate vicinity of the molders, giving them better working condition and the foundry a more orderly appearance.

Distribution of Employes

Latest development in green sand molding equipment is the power conveyor which takes the molds through the various operations, starting at the drag machines and ending at the shakeout. This same system also delivers sand to a central tempering unit from where it is returned to bins over the molding machines. One such unit with a crew of 80 men, produces 2100 cylinder castings weighing 126 pounds each in nine hours, or 26 cylinder blocks per man on a floor space 40 x 260 feet including the necessary gangway and sufficient space for the storing of cores. A smaller size produces 2300 cylinder heads on a floor space 40 x 120 feet. Figs. 1 and 7 show the two units.

In the production of medium sized castings new sand and coal dust are added to the entire sand supply so that no special facing sand is needed over the pattern. The same may be done on larger castings, but due to the cutting action of the metal or the burning in at some small projections a small amount of special facing may be used at certain points.

In molding a cylinder block casting on a conveyor the operations are closely divided. Each molding machine usually is manned by a rammer, a helper and a finisher. The first two produce the mold and the finisher patches or corrects any imperfections, wets the core prints, dusts and brushes the graphite and sets the mold on the conveyor. With a number of core setters, each one may set one or more cores, while the cores may be gaged by a man stationed at the end of the core setting line. After the copes are set, the operations are divided further into clamping, molding the pouring basin, setting the pouring basin, pouring, taking off the clamps and removing the pouring basins. On the shakeout end, the operations call for removing and shaking the cope, taking out and loading the casting, shaking out the drag, removing the bottom board and placing bottom board, drag and cope flask on the conveyor to be returned to the molders. All these operations must be well timed, because congestion at any one point holds up the whole line.

In some production foundries, especially in those producing automobile castings, the core department occupies an important place and its force may

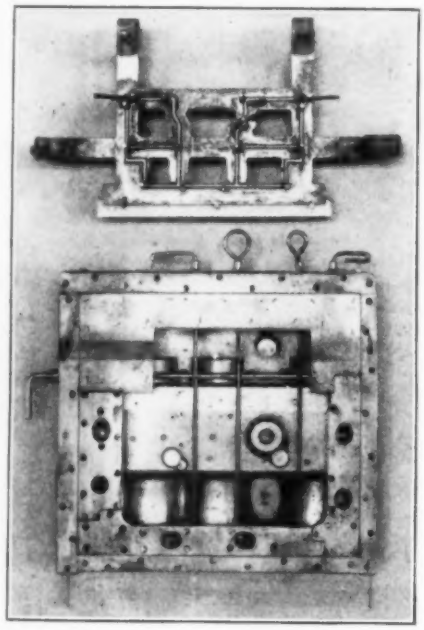


FIG. 9—VENT WIRES ARE SET BEFORE THE COREBOX IS FILLED WITH SAND

exceed that of the foundry. A cylinder block, for example, may require as high as 50 or more separate cores, which if stored in large quantities, would take up a prohibitive amount of floor space. To avoid this, the cores are produced only far enough in advance to get them to the foundry in time to set into the molds. Since at the close of the day there may not be one hour's supply in the coreroom, expert routing through the various operations is required. To insure accurate records and balanced stock, all defective cores, found either in the core room or foundry must be turned over to a department created for the purpose.

Coremaking Methods

Due to the intricate nature of the cores and the necessity of holding them to close dimensions, the core department requires the best of corebox and machine equipment, besides a great number of gages and fixtures. For best results, all cores should be made on machines. Many ingenious coreboxes and devices have been developed to make this possible. Small coreboxes arranged in gangs and mounted on machines, insure greater accuracy and production can be increased materially.

Fig. 10 shows a single box for bench work and a gang box for one of the more difficult cores for use on a roll-over machine. The production in this instance was 500 to 600 cores on a bench compared with 1000 to 1200 on a machine, both made by a girl in a 9-hour day.

Fig. 4 shows an extruding machine producing two sizes of plain cylinder cores. These cores can be made on a bench from a split box, rammed with a stick and rolled on a plate at a daily production of 400. The cores may be rammed in a split box on a small jolt machine and placed on driers, at the rate of 580 per day per man. Extruded on a machine, cut to the proper length by a wire cutting attachment and removed on driers, the production will increase to 2700 cores of each size per day for six men. In each instance, the quality of the cores improves with the increase in production. Fig. 6 is a view of a section of a production core room in which all cores are made on machines either in single or gang core boxes.

Core Driers Necessary

Operations involved in making a core should be reduced to the simplest form and follow a standard practice. Wiring and venting must be determined and definitely located, or indicated in the corebox so that uniformity may be assured.

The best results are obtained if the venting is done by wires placed in the corebox before it is filled with sand, and withdrawn after the sand is rammed. This method produces clean positive vents which can be checked by probing. To prevent the iron from entering the vents all outside openings not needed in passing the vent from one core to another or in leading the gases out through the mold are closed carefully with a paste made of graphite or soapstone and oil. Fig. 9 shows a corebox with vent wires in position.

To speed production and to insure against changes in the method of wiring, all core wires are cut and formed before they are sent to the core maker. Forming is done in a separate department usually equipped with automatic wire cutting and forming machines. Where only small quantities are required the bending may be done quite accurately and efficiently with

hand operated forming dies. Importance of this feature may be appreciated more readily when it is stated that a foundry producing about 400 tons of auto castings per day requiries approximately 500,000 core wires.

Metal core driers are absolutely essential in the production of large quantities of accurate cores at high speed. Necessity of bedding cores slows the operation, produces a rough surface and unless done by an expert, destroys the necessary accuracy required in quality work. With the employment of modern machines, experience and a thorough knowledge of the shrinkage or contraction of the metals to be employed, also the necessary clearances, these driers can be built cheaply.

Assembling The Cores

Assembling cores before they are delivered to the foundry commands a great deal of attention, especially if they are to be assembled on conveyors where each core must fit perfectly. The old method of fitting by rubbing two cores together is a thing of the past. To insure accuracy all joints are ground on surface grinders before they are pasted and if the bores of cylinder water jacket cores are split on the center line of the cylinder, they are bored out on special grinding machines which remove all irregularities. This also establishes a definite center line and removes all possibilities of an uneven wall thickness. Fig. 5 shows some of these grinders. Whenever possible, large core assemblies are put together on progressive lines similar to that shown in Fig. 3 in which the cores are moved along the line on gravity conveyors.

In an automobile foundry practically all this work can be done by girls because the pieces that are beyond their weight limit are moved on gravity conveyors. All assembly jigs into which the cores are assembled are accurate duplicates of the mold. Every bearing surface is lined with hardened steel which can be replaced easily. Since the locating points correspond to the core prints and chaplets in the mold, little trouble is experienced in the foundry from crushes or bad fits. The molders are not permitted to file or otherwise fit a core.

Demand for better appearance, absolute freedom from sand and scale has accompanied demand for closer dimensions and better metals. The tumbling mill which has served so well in producing the much desired burnished appearance many times is not adequate, because it is not always possible nor practical to remove fused sand and scale from small depressions and corners. High grade castings coming into contact with the lubricating oil of the conveyor system must be sandblasted, or sandblasted and tumbled. Castings also must be delivered free from rust which is quite contrary to the theory of weather seasoning prevalent a few years ago. Since the cost of sandblasting, like that of many other operations, was just another item that had to be absorbed by the foundrymen, they were forced to find more economical methods. The continuous sandblast room through which the larger castings are carried on chain conveyors and the continuous sand blast mill which receives and ejects smaller castings in a continuous stream, now are performing the operation at a greatly reduced cost.

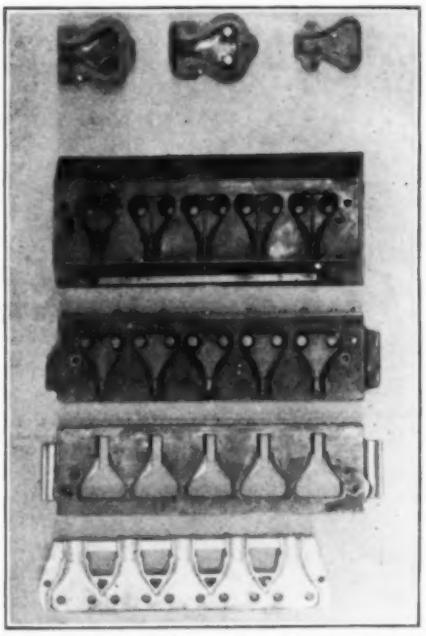


FIG. 10—EXAMPLES OF GANG BOXES MADE ON A PROFILING MACHINE

Inspection Department

A few years ago practically all cylinders and similar castings were chipped with air hammers. Increased demand developed a shortage of high grade chippers which even high wages could not overcome. Electric swing grinders and small air grinders, easy to operate, finally were pressed into service.

To control the losses incident to high quality intricate castings, requires constant checking. A well organized and well equipped inspection department is an absolute necessity. Unless defects are located promptly and accurately reported the losses can take on disastrous proportions. This is especially true where castings are stored by the consumer in large quantities in which case the foundry should insist that a certain number be machined on the arrival of each shipment. This precaution will protect both producer and consumer and prevent any disputes that later might occur.

For many castings it is necessary to build elaborate checking fixtures into which the castings can be set and the areas to be finished inscribed with hardened steel points moving in hardened and ground bushings. On others, where visual inspection is inadequate, the checking can be done by gages and templates. Constant checking enables the manufacturer to maintain dimensions within small limits.

Carry Small Stock

A definite understanding should be had with the machine shop on the extent of the foundry's responsibility, especially as applied to cracked castings. Harmonious relations easily can be maintained, if in additon to this a capable representative of the foundry receives and inspects all rejected material at the machine shops and if means are provided to definitely check disputes over lack of stock or errors in machining.

Progressive manufacturing institutions show a growing tendency to operate with a minimum stock of raw materials. Plants which a few years ago carried a 60 or 90 days supply and in some cases contracted for six months in advance, now operate successfully on a two to three weeks basis, which at times may be reduced to even a shorter period. In a plant producing castings under this condition, the work in progress and the finished castings on hand may not exceed one day's production in the foundry. If, in addition, the shipments must synchronize with the daily production of the consumer the scheduling of output and shipments must receive special attention from those in charge.

Refuse in a large foundry is a considerable item and various means have been devised for its disposal. Belt and pan conveyors take the refuse from hoppers beneath the floor line, from which the sand is raised to storage bins by bucket elevators. If the bins are placed over the railroad tracks, or arranged so that trucks, tramrails, monorails, cableways or other means of conveyance can be placed directly underneath, the sand can be removed cheaply.

Perhaps the most economical and novel installation for removal of refuse is in operation in one of the foundries under the management of the author. Sand is removed from the castings in a room located be-

tween the foundry and the cleaning department, passed through floor hoppers upon a belt equipped at one end with a magnetic pulley which removes the iron and steel scrap. The belt feeds the sand into a crusher which pulverizes all included cores and discharges the material into a tank of water. A centrifugal pump lifts the mixture of sand and water and drives it through a pipe line to a swamp located back of the foundry. Since the water used for plant purposes is taken from a river bordering on this swampy area, transportation costs only include the power for running the pumps and the investment in the pumps and pipe line.

Refuse consists almost entirely of burned core and molding sand and is deposited clean and well pulverized. Eventually it may be reclaimed. From all appearances the oil in the core sand is weathering out rapidly.

According to an analysis of Max Sklovsky, Deere & Co., Moline, Ill., which appeared in the April 15, 1921 issue of THE FOUNDRY, 168 tons of material must be handled to produce one ton of good castings in the ordinary foundry. Material still is moved laboriously by hand methods, but it is safe to predict that the greatest development in the foundry industry in the next decade will be in reducing the handling of materials to a more mechanical basis. A great deal already has been accomplished in this direction, but as in other labor saving devices, the adoption of existing and the development of new means for this purpose largely have been confined to the production foundry.

It may be of interest to point out a few of the performances achieved by the application of labor saving devices. Four men with a crane and magnet move all incoming pig iron and steel scrap from cars to stock piles and at the same time supply the charging deck with all the iron including foundry returns and limestone required for a 600-ton melt. By the use of mechanical sand conditioning and distributing equipment, two men are conditioning and distributing approximately 400 tons of molding sand every 9 hours. In addition to the large output per man-hour, the sand is cleaned of all iron and has a texture and uniformity of bond and moisture that cannot be reproduced consistently on the floor even by the best molders. On a conveyor every day one man sets 4200 cores weighing 45 pounds each and 6 men pour 160 tons of iron into 2100 castings.

Electric lift trucks for moving platforms on which material is loaded effect great savings. The same is true of electric and gasoline trucks and tractors. The most efficient means of transportation is found in the application of conveyors and the tendency in the production foundry to adjust its manufacturing methods to this type of transportation is growing every year. The specialty foundry producing pipe, carwheels, radiators, fittings, etc., has the advantage in this respect and it will only be a short time until the more progressive will have a continuous flow from raw material to the finished product. The foundry producing a greater variety and more intricate castings will find a combination of the continuous and intermittent type of equipment the most economical, especially in the application of continuous core ovens, core delivery and cleaning room equipment.

How one development may lead to another is well illustrated by a recent experience in a malleable foundry with which the author is identified. Practically all the high grade malleable iron produced in America is melted in the air furnace, which does not adapt itself to continuous pouring unless a number of furnaces are arranged so that one always is ready for pouring. This has prevented the malleable iron industry from taking advantage of the benefits to be derived from putting the foundries on a continuous production basis. Knowing definitely the savings that could be affected by more modern methods, a melting process was developed in this plant to make this saving possible. The result to date is a new cupola-electric-furnace-process which not only meets but exceeds the specifications for high grade malleable iron. A series of mold, sand and casting conveyors with continuous mills and continuous annealing ovens mark a definite step forward in the production of malleable iron castings.

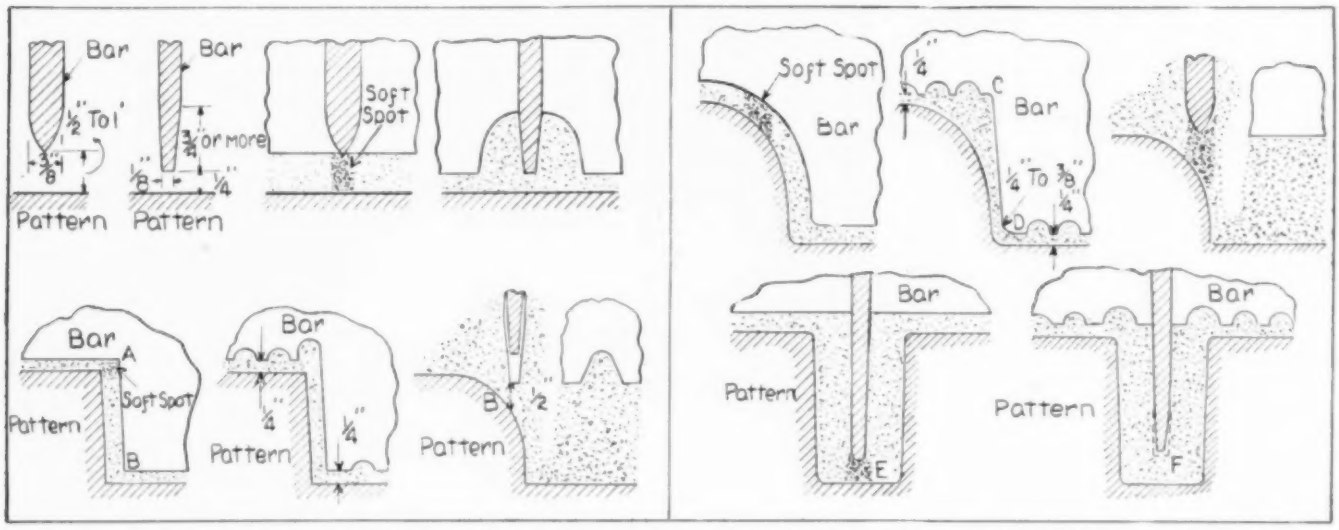


FIG. 11—TYPICAL EXAMPLES OF THE RIGHT AND WRONG WAY TO ADJUST FLASK BARS AT VARIOUS POINTS OVER THE SURFACE OF THE PATTERN

Form Subsidiary

A sales company recently was formed in Illinois to be known as the Joseph Harrington Co. It is a subsidiary of the Whiting Corp., Harvey, Ill., and will market a stoker designed by Mr. Harrington. Officers of the new company are Joseph Harrington, president; T. S. Hammond and R. M. Bourne, vice presidents, and R. A. Pascoe, secretary-treasurer.

Firm Ceases Existence

Thwaites Bros., Ltd., Bradford, Eng., has sold its patterns and goodwill to New Alldays & Onions, Ltd., Small Heath, Birmingham. The buildings were taken over by the Pneulec Machine Co., Ltd., Smethwick, manufacturers of foundry equipment.

Iron and Sand Focus Interest

Annual Meeting of Institute of British Foundrymen Considers Metallurgy of Iron and Discusses Importance of Sand—American Paper Read

By Joseph Horton

NOTWITHSTANDING the somewhat severe handicap imposed by the strike situation and its after effects, the Institute of British Foundrymen held its twenty-third annual convention June 15-18 in London in a manner that compared favorably with any which preceded. Representative foundrymen were present from all parts of the British Isles, from France, Belgium, Germany and Sweden. Official delegates from various foreign associations included: E. V. Ronceray, vice president Association Technique Fonderie de France; M. G. Masson, president Association Technique de Fonderie de Belgique; Dr. Geilenkirchen, secretary Verein Deutcher Eisengiessereien Germany; and Dr. Edholru, past president of the Swedish Foundrymen's association. The convention was held coincident with the international foundry trades exhibition in the Agricultural hall, Islington, London, where a large room was set aside for the presentation of papers and other features of the convention. Technical sessions occupied the forenoon on Wednesday and Thursday. The remainder of the time was devoted to various entertainment features including visits to plants and points of commercial or historical interest with teas and banquets and concluding with a special train and steamer excursion up the river to Windsor and beyond.

The first technical paper on the program was the annual exchange paper of the American Foundrymen's association entitled "Quality Production with Quality of Product" prepared by Arnold Lenz, Saginaw Product Co., Saginaw, Mich., and read in abstract by Vincent Delport, European manager, THE FOUNDRY, Cleveland.

In the discussion which followed E. Longden, Manchester, intimated that further information is required to explain such an American achievement as handling the materials for a 600-ton heat daily with four men. He inquired how many additional men are required to charge the cupolas after the material is dumped on the charging platform. Mr. Harley, Daimler Works, Coventry, agreed with the thesis that quantity production results in improved quality, also it disproves the statement sometimes made that modern methods of production exert a deadening effect on the workman. Design and equipment of the foundry still offers a fertile field for the exercise of skill and intelligence. Some of the conveying equipment described in the paper has been adopted at the Daimler plant and he felt that it might be introduced with profit into many British foundries.

VINCENT C. FAULKNER

New president of the Institute of British Foundrymen, was born at Sheffield in 1888. He was educated at Wesley college and then at the metallurgical department of Sheffield university under Prof. J. O. Arnold. After a period in the metallurgical laboratories of Hobson Houghton & Co., Ltd., and Vickers, Ltd., Sheffield, he specialized in the manufacture of electric steel, being associated with Victor Stobie in his early experience. During the war, Mr. Faulkner spent most of his time on the Continent putting electric furnaces into commission in France, Spain and Italy. About six years ago he was appointed editor of the Foundry Trade Journal. Mr. Faulkner was elected member of the Institute of British Foundrymen in 1908 and was president of the London branch for the term 1924-25. He also is a member of the American Foundrymen's association, the Association Technique de Fonderie of France, the Iron and Steel Institute and the Institute of Metals. He recently was elected president of the Foundry Trades Equipment & Supplies association.

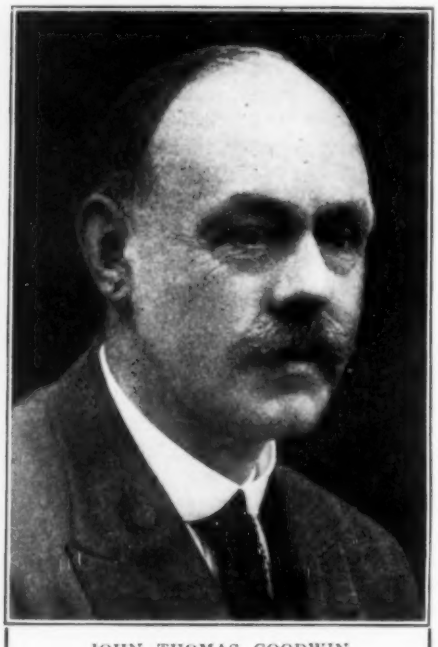
Another point brought out in the discussion was that the technical and mechanical departments of a foundry are of little use unless they are supported by a highly efficient selling organization, capable of creating a market and then keeping it supplied regularly at a profitable figure. H. J. Young, London, claimed he has knowledge of foundries turning out large quantities of casting at 80 or 90 shillings ($18.50 to $21.90) per ton that are unable to make a profit on account of suicidal competition.

E. V. Ronceray, Ph. Bonvillian & E. Ronceray, Thiais, (Seine) France, presented an abstract of the paper, "The Practical Utilization of Apparatus for Measuring the Permeability and Cohesion of Molding Sands," prepared by R. LeMoine, Paris, as the annual exchange paper of the French foundry association. The author expressed appreciation of the methods of sand testing outlined by the committee appointed for the purpose by the American Foundrymen's association. He urged the necessity of selecting mixtures more carefully and of exercising greater control. Proper treatment will insure more uniform results. W. H. Poole, Keighly Laboratories Ltd., near Sheffield claimed that the sand question never had received the attention warranted by its importance. Different conditions existing at various times in individual shops on account of the variation in the quality of the sand simply are astounding. Usually no attention is paid to the sand until trouble actually is experienced. Periodical tests should be made and in this manner greatly reduce the number of potential defectives.

Sand mixing is one of the most difficult operations, according to J. E. Fletcher, British Cast Iron Research association. Effect of sand upon metal shrinkage is not appreciated properly. Immediately after shrinkage commences, the metal is removed from the actual face of the mold and this feature discounts many ideas usually held on the permeability and conductivity of sand. Air rushes through the spaces thus created at a higher speed than usually is imagined. The British Cast Iron Research association and all workers in sand acknowledged the important

work done in America along this line by H. W. Dietert, United States Radiator Corp., Detroit and R. F. Harrington, Hunt-Spiller Corp., Boston. J. H. Young contested the view that air or gas rushed between the casting and the face of the mold. C. Cresty, Newcastle-on-Tyne wanted more information on the permeability of sand at normal temperature.

The first day's session was brought to a close after a presentation of the



JOHN THOMAS GOODWIN

Senior vice president of the Institute of British Foundrymen and also president elect of the Sheffield branch of the Institute of Metals is 49 years of age. He was educated in private school at Ockbrook, Derbyshire, and attended the science and art school at Belper. His first connection with the iron business, although he came from a line of ancestry running back to 1778, of whom many were important factors in iron production, was with the Butterly Co. Later he served with the Dearn & Duff Steel & Iron Co., Barnsley, and finally became junior engineer for the Holwell Iron Co., Melton Mowbray, Leicester, and became manager of the pipe department upon its establishment by that company. He next was works manager for Cochrane & Co., Middlesbcrough, where he reconstructed the foundries, and since 1908 he has been manager of the pipe shops, jobbing foundry and machine shops of the Sheepbridge Coal & Iron Co., Sheepbridge, England. Mr. Goodwin is vice chairman of the council of the British Cast Iron Research association and holds memberships in a number of important technical organizations.

Belgian exchange paper, "Results Obtained in the Improvement of the Qualities of Cast Iron" prepared by Louis Piedboeuf and presented in abstract by M. G. Masson, president of the Belgian technical association who spoke in French.

A modification of the membership qualifications was announced by J. G. Pearce, director of British Cast Iron Research association at the opening of the second day's proceedings. Members of the Institute of British Foundrymen will be admitted as associates at a reduced subscription of 1 pound ($5) per annum. Associates may take advantage of special research in connection with their individual problems. Several features designed to increase the service rendered to foundrymen generally by the association were outlined.

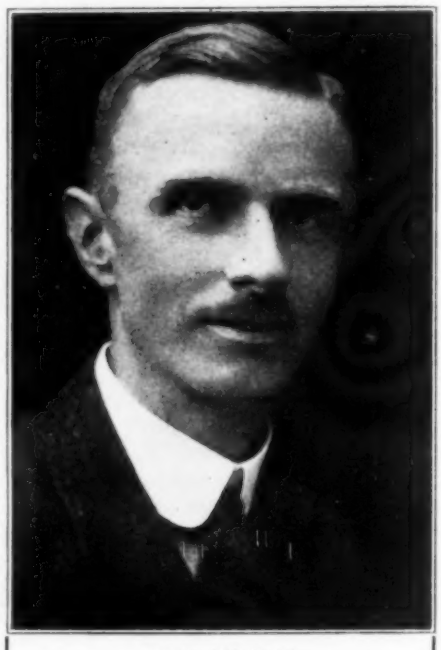
E. J. Yates, B. Sc. read a paper, "Some Notes on the Production of Cylinder Pig Iron to Fracture and Analysis." He dealt with the relative variations of fracture and analysis on the quality and emphasized the necessity of testing by both methods. In the subsequent discussion, J. Shaw, Sheffield claimed that the relation of manganese to the sulphur content will have to be dealt with and that the makers of pig iron mix their different brands to get rid of undesirable lots. This practice often causes trouble in the foundry where dependence is placed entirely on the analysis.

H. Field, Birmingham, also referred to the varying manganese content of iron from a certain district where the manganese content is the distinguishing characteristic. C. Gresty, Newcastle-on-Tyne, claimed that analysis is the only reliable guide. Personally he never examined the fracture or attempted to draw any conclusions from it. F. J. Cook, Birmingham, deprecated this view. In a paper prepared jointly with the late Mr. Hailstone and presented several years ago he showed conclusively that entire dependence cannot be placed on analysis alone. No method of analysis so far practiced can account for the wide difference sometimes noted in the physical characteristics of two irons of the same or practically similar analysis. Foundrymen who depend solely on analysis and neglect to check their findings by fracture examination, are courting trouble.

Scope for Further Work

In advocating the advantage of adopting a standard method for analyzing pig iron Mr. Risdale explained that fairly reliable results are secured by drilling between the center and the outside of the pig. He also condemned the mischievous and misleading blast furnace practice of mixing different lots of pig iron. W. Jolly, Manchester, suggested that a safe works practice is to associate analysis with the shrinkage test developed by the late W. J. Keep, Detroit.

J. E. Fletcher claimed that up to the present little has been discovered, as neither foundrymen nor scientists have traveled far into the mysterious field of the combinations of constituents. No man can say whether the sulphur and manganese relationship or the relative quantity of graphitic and total carbon is the surest index to the character of the iron. However, with a reasonable degree of experience foundrymen can arrange mixtures to meet definite requirements and present specifica-



S. H. RUSSELL

Who has been elected junior vice president of the Institute of British Foundrymen, was born Aug. 20, 1886. He was educated at the Wyggeston Grammar school and also devoted one year to a metallurgical course of Birmingham university under Prof. T. Turner. Mr. Russell entered his father's works as an ordinary apprentice at 16 years of age and worked four years as a coremaker and molder and then one year at Birmingham university. In 1910 he took over the supervision of the foundry under his uncle, who died in 1916, and since 1916 he has been a partner in the firm founded by his grandfather in 1864. He personally supervises all the foundry work. Mr. Russell has served on the council of the British Cast Iron Research association since 1923. He also is a member of the research and publication committees. He was president of the East Midlands branch of the Institute of British Foundrymen in 1923-24 and 1924-25. Mr. Russell expects to attend the International Foundry congress in Detroit this year.

tions. The field for further work is without limit, particularly on the influence of temperatures and gases.

Replying to the discussion W. Jolly stated that all blast furnaces do not mix their products. He mentioned one showing samples at the exhibition in the same building which never mixed brands. Every cast is kept separate and all the stock is sorted according to analysis. Uniformity of product is the goal toward which both blast furnace men and foundrymen are striving. He believes that

maintenance of high manganese insures low sulphur. The thermal condition of the furnace was the most important feature and one that required the closest attention.

The paper, "Some Notes on the Chemistry of the Cupola" prepared jointly by F. C. Thompson, D. Met. B. Sc., and M. L. Becker, B. Met., was read by Mr. Becker who made various suggestions on the most economical and efficient use of heat, reactions of carbon and the best construction form for the cupola and the best methods to adopt to secure perfect combustion.

Gas Samples Used

H. Hird, pointed out that conclusions are inclined to be erratic on account of the difficulty of taking reliable samples. He observed wide variations in samples taken from the same ladle. J. E. Fletcher expanded on the theme by introducing the subject of ash. Percentage of ash in coke exerts a marked influence on the operation of the cupola. He tried introducing slacked lime through the tuyeres instead of through the charging door, but failed to bring it into contact with the molten iron. For lime to be effective, the iron at least must be at the melting point.

J. S. Glen Primrose, A. R. T. C., A. I. M. M., Manchester, presented a paper on "Nonferrous Metallography." W. Lambert, London, suggested the preparation and distribution of micrographs of definite alloys with the composition clearly stated. As a valuable guide to foundrymen he would have micrographs showing the same metal as cast at high, low and correct temperature.

The concluding paper of the session, "Cast Iron for Electrical Machines," presented by J. H. Partridge, B. Sc., University of Birmingham, was followed by a short discussion. The paper gave the results of investigations carried out at the suggestion and under the direction of Prof. T. Turner, to indicate the effect of some of the common elements on the magnetic properties of cast iron.

Hold Annual Banquet

The banquet at the Hotel Cecil on June 17 was largely attended. Sir William Larke, K. B. E., of the National Federation of Iron and Steel Manufacturers promised to supply any future statistics with regard to foundry products in connection with the monthly publications of the federation. The president announced the receipt of a telegram from the Spanish Foundrymen's association, conveying an invitation to the federation to take part in a conference at Barcelona. The principal speaker was the Right Hon. Sir Alfred Mond, Bart., P. C., M. P.

The toast of the Institute of British Foundrymen proposed by Sir Alfred was responded to by the president, V. C. Faulkner. Other speakers were, Oliver Stubbs, John Cameron, J. P., the retiring president, and George C. Pearce, the president of the London branch. A dinner to the overseas guests was given by F. W. Bridges Ltd., the organizers of the international foundry trades exhibition at the Agricultural hall, Thursday evening, June 17.

At the opening session the Rt. Hon. Arthur Henderson, P. C., M. P., a member of the late labor government, extended the official welcome. Mr. Henderson described himself as a product of the iron foundry, molding castings before he began his attempts to mold public opinion, being what is commonly described as a *sand rat*, or an artist in sand. He followed his speech by presenting the Oliver Stubbs medal to A. R. Bartlett, of London, for services of outstanding merit to the foundry industry. The retiring president announced the decision of the council to make Mr. Henderson an honorary life member of the institute.

Mr. Cameron, retiring from the chair welcomed his successor, Mr. Faulkner, as a metallurgist and a journalist who had made his foundry paper indispensible. J. T. Goodwin, general manager, Sheepbridge Iron Co., Ltd., was chosen senior vice president, and S. H. Russell, G. S. Russell & Sons, Leicester, junior vice president. Oliver Stubbs, F. J. Cook and R. O. Patterson were re-elected trustees, and A. R. Bartlett, W. Lambert, H. Pemberton and J. Shaw, members of council.

The newly-elected president congratulated the institute on its rapidly increasing importance and the wide spirit of recognition of its authority. He said it might be necessary in the future to hold two meetings annually, one in London devoted purely to the reading of technical papers, and the second in the provinces or abroad. There is a great need to co-ordinate and tabulate the large amount of technical literature available. It is time that the government recognized the foundry industry as a key industry, and the co-operation of engineers is necessary.

A handsome medal was presented to the retiring president, Mr. Cameron, and a similar tribute was paid to R. O. Patterson, a former president of the British association.

Will Focus Attention on Foundry Costs

At a recent meeting of the American Foundrymen's association committee on foundry costs, a survey was made of existing data on foundries having cost systems. Study lead to the conclusion that relatively few foundries really know their actual castings costs and that the future work of the committeee should be of a character to educate foundrymen to the needs of using adequate systems of a practical nature and to show the advantages to the foundry industry of using uniform cost methods. The committee plans to carry out its program by means of issuing reports and conducting discussion sessions at the annual meetings of the American Foundrymen's association.

The program planned for the 1926 Detroit convention of the American Foundrymen's association will be as follows:

a. A discussion by E. W. McCullough of the United States chamber of commerce, on the economic necessity of adequate cost information.

b. An explanation of how foundry costs can be determined without excessive clerical detail, by R. E. Belt of the American Malleable Castings association.

c. Presentation by the American Foundrymen's association cost committee of an outline basis for practical classification of foundry costs.

In addition the committee is planning to conduct a contest on weight and production estimates of castings from nonferrous, steel, malleable and gray iron foundries. Pattern equipment for castings from each branch of the industry will be on display and those in attendance at the convention will be given a chance to submit their estimates of the weight of the castings and estimates of daily production by use of the equipment. Prizes are to be given to those submitting the best estimates. The purpose of the contest is to focus attention to the needs for accurate information regarding cost factors. The discussion session organized by the committee will be held Wednesday afternoon, Sept. 29.

A bulletin giving the list and publication numbers of over 400 United States government master specifications has been published by the department of commerce. This bulletin is miscellaneous publication No. 73 and may be obtained from the superintendent of documents, government printing office, Washington, for five cents.

International Foundry Trades Exhibition at the Royal Agricultural Hall, London

Exhibit Foundry Equipment

International Foundry Trades Exhibition in London Embraces Representative Products of British, American and Continental Manufacturers

By Vincent Delport

European Manager, THE FOUNDRY

GREETING Sir Robert Hadfield, chairman of Hadfields, Ltd., of Sheffield, who formally opened the International Foundry Trades Exhibition in London on June 10, V. C. Faulkner, chairman of the Foundry Trades' Equipment and Supplies Association, Ltd., stated that the foundry industry is one of the principal key industries of the country and, as such, deserves due consideration. Sir Robert, reflecting on the difficulties of the moment, said that the organization of so great an exhibition at such times is a wonderful achievement. He said that the Foundry Trades' Equipment and Supplies Association, Ltd., which promoted the exhibition, F. W. Bridges & Sons, Ltd., the organizers, and the exhibitors were to be congratulated. At the luncheon which followed the opening ceremony and which was given by Messrs. Bridges, the guests of honor were Sir Robert Hadfield and Sir William Larke, director of the National Federation of Iron and Steel Manufacturers.

The coal stoppage continuing after the general strike one month ago prevented a number of firms from taking part in the show, but the 60 odd exhibits which were displayed were fully representative of the industry.

British Display Machines in Operation

AN IMPORTANT feature of the show was the display of melting plants. The Pneulec Machine Co. Ltd., Smethwick, Birmingham, showed a plant consisting of a bottom section of a standard windbelt type cupola, and two geared crane ladles. A sectional model of the company's special spark arrester also was shown. The firm also displayed its electrically operated jolt molding machine.

The Constructional Engineering Co. Ltd., of Titan Works, Birmingham, exhibited a plant composed of a complete melting unit. Improvements are embodied in the cupola, particularly in connection with the independent control of the area of each tuyere and the arrangement of separate inspection and poking holes which permit of an uninterrupted view of the interior melting zone when poking.

Sydney Evans of Cannon Street, London, exclusive agent for Messrs. Ketin & Thirlart of Liege, Belgium, exhibited a sand preparing plant which combines a sifter, a mill and a disintegrater. Sydney Evans also displayed samples of silica sand.

The International Foundry Equipment Co., Birmingham, showed castings of various kinds with technical data relating to high duty cast iron as produced under the Thyssen Emmel process. Bagshawe & Co. Ltd., Dunstable, displayed working models of conveying equipment.

The molding machine section afforded the visitors an opportunity of investigating the latest improvements achieved in Great Britain and France.

The Britannia Foundry Co. Ltd., Coventry, displayed turnover jolt molding machines and hand molding machines, adjustable hand ram molding machine, a core oven with trolley and a foundry sand mixer.

John Macdonald & Son, Ltd., Glasgow, had an exhibit consisting of a pneumatic jolt and pattern drawing or stripping plate molding machine of new design. The machine will accommodate eight different sizes of flasks. A pneumatic jolt turnover and pattern drawing machine with table 24 inches square and of 672 pounds lifting capacity also was shown.

The Universal System of Machine Moulding & Machinery Co. Ltd., Queen Victoria street, London, is a subsidiary firm of Bonvillain & Ronceray, Choisy-le-Roi, near Paris, France. It showed a full range of hydraulic molding machines and sand plant featuring several improvements. The outstanding exhibit was a standard molding machine with the down or bottom sand-frame. The ramming is done from the bottom. Other displays were, a portable sand disintegrater, core sand mixers, samples of core oil, pattern plates, stripping plates, core-boxes, and a new type of pulley block.

J. B. Corrie & Co. Ltd., London, who are sole agents for the firm of Alfred Baillot & Co., Paris, France exhibited four types of hydraulic molding machines in which the ram is located underneath the table and is operated by hydraulic distributing valves with a 3-way control. A semiautomatic sand plant also was shown, being a one-pan mill with a capacity of about 4 tons per hour.

The Denbigh Engineering Co. Ltd., Tipton, Staffordshire, displayed several machines, the larger types being of both straight-draw and turnover types.

Show Sand Handling Equipment

An important section of the exhibition consisted of sand blast plants and sand preparing machines. Establishments A. Sisson-Lehmann, Charleville, France, exhibited a complete sand blast apparatus. This machine is a modification of their previous heavy type, for use in medium size foundries. The company also showed a new molding machine for light work that can be operated by women.

The Rapid Magnetting Machine Co. Ltd., Birmingham, displayed a sand separator used for automatically extracting the iron content from used sand.

L'Outillage de Fonderie of Paris, France, exhibited a sand mill with differential runners. The base and the rotating pan are in hard cast iron and the pan has a false bottom. The company also showed an electrically driven ladle, a hand molding machine on which both the cope and the drag can be rammed, a portable drying oven utilizing coke dust, and ladles of a capacity ranging from ½-ton to 1 ton.

The Fordath Engineering Co. Ltd., West Bromwich, exhibited a new type of mixing machine which has a revolving pan which is mounted on ball bearings and is so constructed that the sand when mixed is automatically discharged at a certain point while the pan is revolving, the discharge being effected by means of four sliding doors operated by a cam.

The British Drying & Heating Co. Ltd. of London, had an exhibit which comprised heating elements in both portable and permanent built-in-forms. Two heaters manufactured by this company recently arrived in America and are being tried out by the United States Steel Corp. A portable machine for the preparation of used and new sand, which is electrically driven, also was displayed.

James Keith & Blackman Co. Ltd., London, showed dust separator fans for the removal of grit and other impurities from air or flue gases. Broom & Wade, Ltd. of High Wycombe, exhibited various types of air compressors, one of which was a portable petrol-engine driven self-contained machine.

The General Refractories Co. Ltd. of Sheffield, displayed a collection of refractory materials including fire bricks formed of magnesite, chromite, sillimanite, silica and fire clay. They also showed samples of sand produced by the Yorkshire Amalgamated Products, Ltd. Silica cement, silica paint, fluorspar flour and various ganisters also were exhibited. Thomas & Bishop, Ltd. of London, showed samples of refractory cements and textile belting. Beecroft & Partners, Ltd., Sheffield, had an exhibit of core oils and cores made with these oils.

The Blackfriars Foundry Requisite Co. Ltd. of London, exhibited various grades of coal dust and blackings made from selected Yorkshire coal by Messrs. J. & J. Dyson, Ltd. of Sheffield, Chesterfield and Stannington.

Representative Manufacturers Exhibited Modern Machines For Use in the Foundry

William Cumming & Co. Ltd., Glasgow, showed a wide range of foundry facings. Thomas E. Gray & Co. Ltd., London, converted its stand into a section of a quarry where its products were displayed.

Sterling Foundry Specialties, Ltd., Bedford, which is associated with the Sterling Wheelbarrow Co., Milwaukee, Wis., showed a wide selection of rolled steel molding flasks of various sizes and styles suitable for iron, brass, steel and aluminum foundries. A variety of portable electric tools was displayed by S. Wolf & Co. Ltd., London. Pneumatic tools, including chipping hammers, core breakers, floor and bench sand rammers, pressure-seated air valves, etc., made by the Cleveland Pneumatic Tool Co., Cleveland, were shown by John Macdonald & Co., Glasgow. That company also exhibited a combination jolt and squeeze machine of the portable type manufactured by the Berkshire Mfg. Co., Cleveland. H. G. Sommerfield, London, showed a variety of asbestos protective garments, safety goggles, sand blast helmets, welders' masks, etc.

Demonstrate Pyrometers

Various scientific instruments could be seen at the exhibition. Chas. Hearson & Co. Ltd., London, displayed metallurgical microscopes manufactured by C. Reichert in Australia, including a new ore microscope. This firm also showed an electric muffle furnace and an all-metal drying oven. The Foster Instrument Co., Letchworth, Herts., showed pyrometers. Ogilvy & Co., London, exhibited a large metallographic microscope with camera manufactured at Wetzlar, Germany, and low-power oil immersion objectives. This company also displayed its workshop microscope for measuring Brinell impressions, and electric microscope illuminants. F. Davidson & Co., London, exhibited a microscope which can be employed both visually and photographically at magnifications from X25 to X4000. The Bowen Instrument Co., Leeds, showed pyrometers of thermoelectric, electric resistance, radiation and optical types, and rheostats for the control of electric currents. The Monometer Co. (1918) Ltd., exhibited a patented process of pressure die-casting for making axle box bearings and housings for rolling stock, and a die-casting machine for the pressure die-casting of various parts of automobiles, wireless parts, etc.

Samples of various brands of pig iron, ferroalloys, coke, refractories, grinding material, etc. were displayed by Bessler, Waechter & Co., Ltd., London; Consett Iron Co. Ltd., Durham; Lilleshall Co. Ltd., Shifnal, Shropshire; British Pigirons, Ltd., London; and Bradley & Foster Ltd., Darlaston. Lysberg, Ltd., London, showed photographs of the coking plant of North's Navigation Collieries Ltd.

The technical exhibition was of special interest and included several sections. Displays by the National Physical Laboratory organized by Dr. W. Rosenhain, the research department of Woolwich organized by Dr. H. Moore, the British Nonferrous Metal Research association, the University of Sheffield organized by Dr. C. H. Desch, University of Birmingham organized by Professor T. Turner, and the British Cast Iron Research association organized by J. G. Pearce attracted attention. A selection of typical castings was shown by R. J. Shaw, and a range of standard and typical qualities of pig iron was exhibited by H. Shillitoe. Dr. Geilenkirchen, secretary of the Verein Deutscher Eisengiessereien, sent to the exhibition part of the technical exhibit which was shown at the Birmingham exhibition in 1925.

Readers Comment

Note—Material appearing under this head does not necessarily reflect the opinion of The Foundry or of its editors.

Questions Metal Costs

To the Editors:

On page 483 of the June 15 issue of THE FOUNDRY, Mr. Haddock asks for additional information regarding the article by Albert E. Grover on foundry costs which appeared in the April 15 issue.

In his reply to Mr. Haddock, Mr. Grover submits a table and explanations showing how the cost of $1.46 per 100 pounds of metal at the spout is derived. However, he does not state what kind of a foundry was able to melt iron at that cost. I do not take exception to the fact that there might be a foundry with such low melting cost, but I do not believe this is average.

According to Mr. Grover's table 416,000 pounds of good castings were produced from a total charge of 534,-081 pounds or 77.9 per cent. It is my belief that in general, the light and medium heavy foundry obtains 50 to 60 per cent good castings. With that average and keeping the melting cost as low as possible, cost at the spout runs from $1.75 to $2 per 100 pounds which is 20 to 25 per cent higher than the cost shown in the table.

Very truly yours,
WALWORTH RUN FOUNDRY CO.
Cleveland, O.

Costs Are Illustrative

To the Editors:

I appreciate the Walworth Run Foundry Co., calling attention to a discussion of my recent article in THE FOUNDRY, referring particularly to the letters on page 483 of the June 15 issue.

As noted in the original presentation, this article was intended primarily to show a *method* of arriving at cost figures, and in no sense was to be accepted as actual costs of certain jobs or operations. I think the Walworth company will agree that such a wide variation in costs is encountered, even in shops making similar work, that it would be unfair to put forward specific figures unless all of the factors influencing these costs, also were offered.

It is unfortunate that certain foundrymen and others, including the Walworth Run company accepted these figures for cost of iron at the spout as typical, and I trust that this explanation may serve to remove any misapprehension.

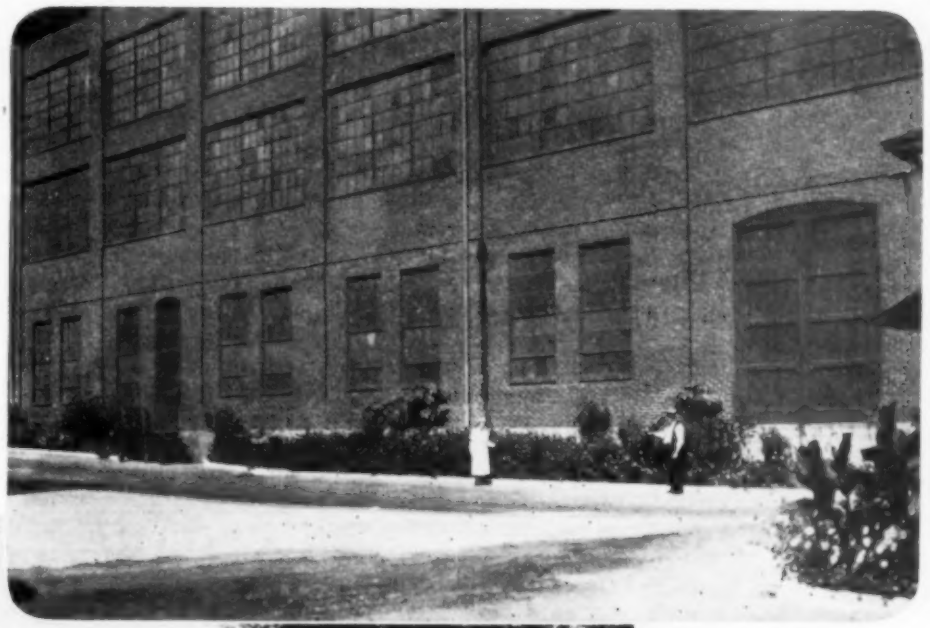
Very truly yours,
ALBERT E. GROVER
Berea, O.

Meeting Is Held

The board of administration of the Ohio State Foundrymen's association held a meeting at the Gibson hotel, Cincinnati on June 16. An invitation to hold the next annual meeting in Cincinnati was presented by a group of Cincinnati foundrymen. The invitation was accepted and accordingly the next annual meeting will be held in Cincinnati, Sept. 16 and 17. The secretary presented a letter from the college of engineering, Ohio State university, Columbus, O., inviting the support of the association on molding sand research and investigation and allied subjects. The board instructed the secretary to advise the university of the association's willingness to cooperate.

Flowers and Shrubs Brighten Grounds Around a Steel Foundry

EXECUTIVES of many manufacturing companies believe thoroughly that it is good policy from various standpoints to make their plants as clean, comfortable and as attractive in appearance as possible. The illustrations herewith show what has been done to beautify the large plant of the Birdsboro Steel Foundry & Machine Co. at Birdsboro, Pa. Instead of drab walls, the workmen are greeted by waving iris and huge cannas. They are welcomed by goldenglow, roses and flowers of many other varieties. During the winter months there are evergreen shrubs. The expense of this beautification is small and the benefits are considered great. The flower beds with their bright blossoms have been shown to help in building morale. They have an effect on the usual individual of making work seem somewhat easier and they help to dissipate gloom and discontent.



Flowers transform appearance of entrance way and blank walls.

American and British
Aluminum Specifications
Differ in Requirements

By George Mortimer

WITH the exception of castings for marine work, practically all of the requirements of the British Isles in aluminum castings are taken care of by the British Engineering Standards specifications for light casting alloys.

These specifications are briefly tabulated in the accompanying table.

Best known and most generally used in Great Britain is alloy 2L5. Thirty years ago, when aluminum casting was in its infancy it was found that, although the pure metal could be cast, its properties were unlikely to attract engineers. Tensile strength was relatively low, and machining properties left much to be desired. Addition of zinc, a cheap and convenient metal which could be added direct to the pot, considerably improved matters. The tensile strength could be doubled and machining was excellent, consequently aluminum-zinc alloys became popular in England and on the Continent. The amount of zinc added varied from 8 per cent to 20 per cent, and gradually settled down to a compromise of some 15 per cent.

Zinc has one drawback in that for a wide range of temperature after freezing all aluminum-zinc alloys are weak. They are tender in the mold, and at a time when much contraction is taking place. Zinc alloys are hot-short, a prolific source of cracked castings.

Substituting about 3 per cent of copper for an equivalent amount of zinc gives an alloy no less strong and at least as easy to machine, while the tendency to hot-shortness definitely is reduced. Thus we get an alloy 2L5 which has been in steady use for at least twenty years, and which still is used in England to the exclusion of most others for such parts as automobile crankcases and gearboxes, and highly stressed parts of a similar nature on airplane engines.

Properties of 2L5 in practice are summed up best under the term reliability. Castings in this alloy are remarkable for sheet reliability, under widely varying conditions of climate and service, when conscientiously made. This applies in particular to parts working under heavy alternating stresses, a fact possibly traceable in part to the propensity of this group of alloys to age. This ageing may be an advantage or the reverse. It has been known to cause cracks in important castings long after delivery to customers. The ageing effect may be brought under control by a reasonable attention to relative rates of cooling thorughout the casting, which is the essence of good foundry work. Attention to this detail produces a casting which will improve materially in physical properties in service, an improvement which in certain observed cases has amounted to 30 per cent within 10 months. Ageing may be strengthened by the addition of a small percentage of magnesium, and further by quenching and annealing.

2L5 is an easy and fluid alloy to work with in the foundry, reasonably cheap, strong and stable in all climates, and with a long record of reliable service which tends to give confidence to designers. However, in applying it to engineering, one fact has to be borne in mind. The aluminum alloys containing zinc are weak at high temperatures. This alloy never is used for automobile pistons, or other such work.

Castings required to withstand high temperatures are cast better in a straight copper alloy, the best known of which in England is 3LII. As far as the United Kingdom was concerned the copper alloys little were used until the war, when serious efforts were made to find a more satisfactory alloy for aircraft pistons than was afforded by the zinc group. One of the more successful was an alloy consisting of 7 per cent copper, 1 per cent zinc, 1 per cent tin, and the balance commercial aluminum. This alloy was given the title LII. Later it was found that even this small percentage of zinc was detrimental at high temperatures, and was dropped, and the alloy became 2LII. Later, the tin content was made optional. It is not quite clear why tin ever was included, except possibly on the grounds of a slightly lower crystallization shrinkage. The final specification, 3LII, is now for all practical purposes identical with No. 12, an alloy which has been proved out in practice to quite the same extent as 2L5, and which has the further advantage in being better able to withstand high temperatures.

The higher the copper extent the lower the total shrinkage, and this may help in the production of obstinate castings. Within limits, the more copper used the less the tendency to general porosity, a point of value in the production of castings designed to withstand hydraulic pres-

Standards Differ

Differences in opinion exist between authorities as to the proper method of securing a test bar that will indicate the properties of aluminum and aluminum alloy castings. In the United States the test bar cast integral with the casting sometimes is used while in England the separate chill cast bar is standard. This paper which was presented at the annual meeting of the American Society for Testing Materials held at Atlantic City, N. J., June 21 to 25, is unusually interesting because the author George Mortimer, points out the differences in British and American specifications and cites the advantages of each. He also states that in his opinion that few test bars will give the strength of the casting, but by attention to details in making the test bar consistent results may be obtained, and any change in material or melting practice will be revealed. Mr. Mortimer is managing director of William Mills Ltd., Birmingham, Eng.

sures. Finally, a higher copper content gives a relatively hard, well-finished machined surface, suitable for such parts as automobile pistons.

However, the addition of copper must be controlled, for it involves an increasing brittleness in the casting, with an increase in weight disproportionate to any gain in strength.

Issue Specification

A specification was issued covering a copper content of 12 per cent as a standard guide to designers and founders and the resulting alloy is known as 2L8. It is used for the great majority of automobile pistons cast in England, whether in sand or in permanent molds.

Alloys so far described represent the repertory of the majority of founders in the British Isles, and they meet the needs of about 80 per cent of the requirements in that country for aluminium alloy castings. It is not claimed for any one alloy that it necessarily represents the last word in light alloy founding practice, but it has the great advantage of facility of working, of being well understood by designers and founders, and of a long record of reliable service under widely varying conditions of design, duty and climate.

Specification L24, probably more widely known as *Y* alloy remains. It is an alloy of the duralumin class which lends itself readily to the process of casting. This alloy is primarily the product of the National physical laboratory in its wartime attempt to produce a piston alloy giving the maximum strength at working temperatures consistent with high thermal conductivity and good frictional properties. History of its development is detailed in the eleventh report of the Alloys Research committee. The main point of interest in the alloy is its susceptibility to heat-treatment, and the excellent tensile and fatigue properties exhibited by a casting in this alloy when properly cast and heat-treated.

With growing knowledge of essentials of heat-treatment of light alloys generally, there has been a decided reaction in favor of L24. Its properties have been found of constructive value in light alloy engineering. It has tended to open up new fields for aluminum casting subject to stresses or severel duty. It is doubtful whether the test bar figures shown in the table for the heat-treated alloy often are found in sand castings, or even in all parts of an intricate permanent mold casting. In the author's experience, the physical properties of heat-treated castings in this material are almost invariably a marked advance on those shown for the same sections cast in the other alloys. In addition the material may be said to possess a toughness and reliability in service which is difficult to convey at present by means of specification figures. Whenever large diesel engine pistons have to be made to withstand abnormal temperature conditions, or a differential casting is required for some special racer, or any aluminium casting is needed for some special high duty service, *Y* alloy is specified in nine cases out of ten, although the founder would prefer to use almost any other, if he had the same confidence in the results.

Apart from general clauses, following substantially the same lines in most countries, castings primarily are accepted or rejected in the rough on analysis and on the results of tensile tests of a standard bar.

Clauses dealing with the provision of the bars, their manufacture and dimensions, are of interest and therefore are quoted in full:

Clause 7 Tensile Test

a The test pieces shall comply with the following test, which shall be carried out by the *Contractor* at his works in the presence of the *Authorized Inspector* and to his satisfaction.

b Sample pieces as specified in cause 8 shall be turned to the dimensions of British standard test piece *C*. A suitable test piece is shown in Fig. 1. When tested they shall give . . .

Ultimate tensile strength . . . Not less than—tons per sq. in.

Elongation . . . Not less than—per cent.

c The test pieces shall not be annealed, hammered or otherwise treated before they are tested.

Clause 8 Provision of Test Samples

a At least one sample shall be cast to represent each large cast-

British Specifications for Light Casting Alloys

Spec. No.	Specified Chemical Composition	Specified Impurities not to be exceeded					Minimum Tensile Properties called for by the specification conditions		Average tensile properties obtained under those conditions		Specific Gravity
		Iron Per Cent	Silicon Per Cent	Lead Per Cent	Zinc Per Cent	Tin Per Cent	Ultimate Strength Strength lb. per sq. in.	Elongation on 2 inches Per Cent	Ultimate Tensile Strength lb. per sq. in.	Elongation on 2 inches Per cent	
3L11	Copper not less than 6 per cent nor more than 8 per cent Tin may be present up to 1 per cent Aluminum the remainder	0.80	0.70	0.10	0.10	—	Not less than 20,160	Not less than 3	20,160 to 29,640	4 to 6	2.88
2L8	Copper not less than 11 per cent nore more than 13 per cent..... Aluminum the remainder	0.80	0.70	0.10	0.10	—	Not less than 20,160	Nil.	24,640 to 26,880	1 to 2	2.90
2L5	Zinc not less than 12.5 per cent nor more than 14.5 per cent..... Copper not less than 2.5 per cent nor more than 3.0 per cent..... Aluminum the remainder	0.80	0.70	0.10	—	—	24,640	3	31,360 to 35,840	6 to 10	3.00
L24	Copper not less than 3.5 per cent nor more than 4.5 per cent.... Nickel not less than 1.8 per cent nor more than 2.3 per cent..... Magnesium not less than 1.2 per cent nor more than 1.7 per cent Aluminum the remainder	0.80	0.70	0.10	0.10	0.10	As Cast Not less than 24,640		As Cast 20,160 to 24,640	1 to 2	2.85
							Heat-Treated (No specification yet issued)		Heat-Treated 38,080 to 49,280	3 to 6	

The aluminum used for the above alloys shall be virgin metal. No scrap shall be used other than that derived from the maker's own manufacture under this specification. The copper shall assay not less than 99.3 per cent. The nickel shall assay not less than 99 per cent. The zinc shall assay not less than 99.5 per cent.

Test bars 1 inch in diameter and 7 to 9 inches long, cast in iron chills which have been heated before they are filled. The bottom of the chill closed with a sand or clay plug.

ing. For small castings the number of samples shall be settled by the authorized inspector (generally arranged to represent each heat: author's note) so that all the alloy used is tested. The samples shall be cast from the same ladle as the castings and shall be poured first.

b The samples shall be 1 inch in diameter and from 7 to 9 inches long. They shall be cast in iron chills which have been heated before they are filled. The bottom of the chill shall be closed with a sand or clay plug, not with a metal end.

In these two clauses the British specifications depart essentially from accepted American practice. The latter aims primarily at indicating to the engineer something of the properties he will find in the casting. British practice aims entirely at a standard test which will reflect the quality of the material going into that casting, and it is contended that the integral sand-cast coupon cannot fulfill reliably that function.

As a founder of aluminum alloys, with experience in both test systems under routine conditions, the author offers the following observations for what they are worth:

Practice Is Simple

The American practice has a great advantage in simplicity and economy, in the avoidance of special molds and extra handling. There is no machining to more or less fine limits or delay of castings while this is being carried out, and no elaborate system of stamping and checking to insure correct co-relation of bars with their castings. On relatively simple work the American design of coupon can reflect fairly the properties likely to be found in the casting it is cut from.

However, the great majority of castings nowadays are by no means simple, and as every designer knows, the properties tend to vary materially throughout the different sections. Sections, which owing to their position, cannot be fed or chilled adequately. Cores so positioned that they cannot be fully vented. Others are of lengthy and delicate design, which must be strong to stand handling and are too strong to allow full contraction of the casting. The effect is a wide variation in tensile strength and elongation in different parts of a casting, amounting in observed instances to as much as the actual figures called for by the specification itself. This is recognized generally, and a designer of experience uses a material he understands, and allows a good margin of safety in his scantlings.

The sand-cast integral coupon may or may not indicate the quality of the material or the standard of melting practice. It may reflect rather the individual skill of the foundryman in its placing, molding and feeding. The coupon may be attached to thick or thin sections, molding in green or dry sand, cast upright or horizontal, and in fact be liable to most of those variations which affect the results throughout an ordinary casting. Further, unknown quantities are introduced by surface irregularities, the effect of the skin, and the effect on results of a relatively small internal defect, perhaps normal to sand castings but bearing an undue proportion to the sectional area of the small bar.

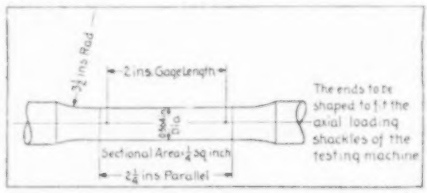

3½ ins Rod
2 ins Gage Length
The ends to be shaped to fit the axial loading shackles of the testing machine
Sectional Area ½ sq inch
2¼ ins Parallel

FIG. 1—BRITISH TEST BAR IS TURNED DOWN TO THE DIMENSIONS SHOWN IN THE DRAWING

Therefore, the British standards authorities contending that an integral bar necessarily does not give much information about the casting. Specify a bar cast separately, under conditions calculated to give even results, and aiming at removing the variables associated with a bar cast integral with the casting.

It must be admitted that as the British specifications stand they do not accomplish their object. They sweep away a host of unknowns only to introduce a range of new ones. Following are five such unknown factors:

a Temperature of metal poured.
b Temperature of chill mold.
c Rate of pouring.
d Thickness of chill.
e Chill design and dressing, in relation to freedom of contraction in the bar.

Probably there are others, but any one of these factors can affect materially the results on a series of bars cast from the same pot of metal, and not one of them is referred to in the specifications. Therefore, the system as it stands falls short of the ideal, as definitely reflecting the quality of the material going into the mold.

Glancing through the specification, all that appears to be necessary is the provision of iron mold near the job, which the molder fills up before he pours his casting. However, if the above points are disregarded, far more widely varying results may be obtained than are ever experienced with the sand-cast coupon. The writer has frequently seen a costly and difficult casting irrevocably turned down owing to complete failure of its test bars to give specification figures, while its neighbor, cast at the same time from the same pot of metal, is passed on figures as ridiculously high. While that state of affairs is possible, the separate, chill-cast bar cannot be regarded as an accurate gage of the quality of material. If it cannot be so regarded, then there seems little excuse for departing from the essential simplicity of the integral cast bar, cast to size, without machining.

The author is inclined to favor the principle of testing accurately the quality of the material, as distinct from indicating the strength of a casting. With this in view the specification requirements have been carried a little further in the foundry he is associated with, and the following procedure has been adopted as the result of a long series of practical tests:

Enroute to the mold the crucible passes first to a small gas-fired furnace fitted out with a pyrometer, and metal for the required number of bars is poured into a pot in that furnace. If it is above the standard temperature it is allowed to cool down to it. If below, gas is turned on until the temperature is right. The standard temperature decided on is 730 degrees Cent. for 3LII, 715 degrees Cent. for 2L5, and 745 degrees Cent. for *Y* alloy, L24.

Chill molds are arranged in rack alongside this heating unit, and are fixed at an angle slightly inclined from the vertical. Beneath each chill mold is a gas burner which maintains the chill dry and between the temperatures of 100 degrees and 150 degrees Cent. The difference in physical properties in bars poured into chills at anything within this range appears to be negligible.

Use Machined Molds

Cast iron chills, machined to a fine finish within have an even section of ½-inch. They are split vertically and the two halves are spigotted together. The vertical joint is made accurately to avoid the formation of any sort of flash which could check free contraction of the bar. Before each bar is cast, the chill is dressed with graphite to prevent as far as possible any friction between the bar and mold when the former is contracting. In addition, the upper half of the mold is fitted with a handle, and is removed immediately the bar has set sufficiently, to allow free contraction. The precautions taken in regard to

contraction of the bar are the result of much experimental work on the part of Dr. N. F. Budgen, the company's chief metallurgist, who found that this factor had an important influence on both the tensile and elongation results obtained.

The pouring temperature of the metal of the casting is adjusted in the furnace. Chill thickness is standard for all jobs, and the temperature is fixed within a range found to cause no material variation. The rate of pouring reasonably is fixed by the employment of a ladle drilled with a small hole instead of having the usual lip. The pouring is so slow that the lower sections are almost solid before the mold is half full, and this takes care of crystallization shrinkage without the necessity for a header, which might check the subsequent solid contraction. The latter is free owing to the absence of flashes or headers, and the presence of a smooth graphite surface.

Net results of these refinements are first, a striking improvement in test bar figures, and the average figures represent the actual strength of the casting less than ever.

Second it safely may be said that many of the essential variables are removed, so that test bar results do begin to reflect the actual quality of the melt. Bars from the same melt, whether giving high or low figures, do at any rate tally within reasonable limits.

Third, the arrangement is well worth while from the founders point of view. In conjunction with daily analyses and pyrometer charts, test bar results obtained under these fixed conditions constitute a useful barometer as to the state of affairs in the buying department, and the melting shop. Incidentally it is a barometer with a large scale dial. For instance, in alloy 3LII-No. 12, the specifications calls for 9 tons tensile with 3 per cent elongation. In the author's experience, whatever the grade of metal used, the casting either passes or it does not, when using the integral cast bar. The range of properties noted appears to be limited. When using a chill mold the properties vary widely according to the conditions.

This is more clearly illustrated by reference to the figures shown in the table. In the alloy 2L5; aluminum, 84 per cent; zinc, 13 per cent; copper, 3 per cent, it is seen that although the specification calls only for 11 tons with 3 per cent elongation, the results obtained under routine conditions vary between 14 and 16 tons with from 6 to 10 per cent elongation.

As a matter of fact, the author took some virgin materials of over 99 per cent purity and had six bars put through routine practice for the purposes of this paper, and the results are as follows:

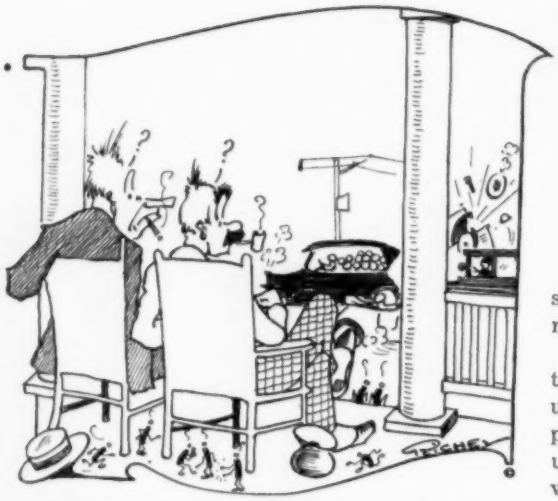
Tensile strength in lb. per sq. in.	Elongation on 2 inches, per cent
38,980	9.0
38,240	8.0
37,860	10.0
36,830	8.0
39,870	10.0
39,444	10.0

The lesson to be derived from these figures, apart from the high results possible under ideal conditions, is the consistency of the figures. That consistency is found throughout the whole range of desirable or undesirable material, from 22,400 pounds, with 2 per cent elongation, up to 38,080 pounds with 10 per cent elongation. As long as bars are cast from the same melt, they closely will tally in their tensile results, and reflect the quality of material going into the casting.

This is a point of real value to the founder of aluminum alloys, who has to contend with at least two sources of contamination which at present cannot be determined well by routine analysis. These are the content of alumina and the content of dissolved gases. He may buy the best metal in the world, but these two factors may upset all his calculations owing to carelessness in melting. They cannot be shown up as yet by any analytical process known to the author, but their effect on test bars cast as described is immediate and quite definitely marked. When his test bar figures fall off, he may feel reasonably confident that material or melting practice needs attention, simply because the chief variables associated with a sand-cast coupon, or a chill cast separate bar made under unspecified conditions, are absent.

It will always be difficult to gage the strength of a casting from a bar cast integral with it. If in view of this, it is decided that a gage of the quality of the material going into that casting is the more satisfactory test, then the test should be so specified in detail as to remove all variables of practical import, other than those directly associated with quality of material. It appears that both the integral sand-cast coupon and the chill cast bar as specified by the British Engineering Standards association standards fall short of this ideal.

SATISFIED contentment well might be the title of this group who are members of the office, engineering department and officials of the Farrel Foundry & Machine Co., Ansonia, Conn., and attended the annual outing held at Double Beach, Conn., on June 26. A baseball game between the married men and the single men followed by other athletic events created much friendly rivalry. A shore dinner followed by short addresses by various officials of the firm ended a perfect day.



Bill Explains How To Make a Kettle

By Pat Dwyer

BILL and I sat on the veranda last night watching the passing procession, little cars, big cars, long cars, short cars, old cars, new cars, some of them bright and shiny, conveying the impression of ease and opulence, others at which any self respecting junk man would be justified in turning up his nose. I commented idly on the fact that if I had to choose between driving one of these disgraces to the national highways and walking, I would prefer to walk.

"Well," said Bill, "I'll tell you. It all depends on how far you had to walk. I've seen the time when the veriest old can that groaned its way to the junk pile would have been as welcome as the president's private limousine or the chariot of fire which wafted Elijah into heaven. I would have hailed with delight anything on two wheels or four that promised me a chance to rest my poor tired feet. Verily, my son I would have ridden in a wheelbarrow if I could have persuaded any good natured person to push it for the last long weary mile.

"Many years ago, so many in fact that the remembrance seems almost like a dream, in the days before automobiles were invented, in a word to be brief, the summer I was approaching my fourteenth birthday, two other young lads and I decided to go on a hunting and camping expedition. Bob's uncle was a member of a rod and gun club which maintained a cabin on the shore of a harbor about 15 miles from our home. In the spring and fall the gun club used this place as headquarters while engaged in the pleasant occupation of shooting innocent wild geese that were silly enough to tarry on their migration north and south.

Bob assured us he could get the key for this haven of refuge and of course we were too polite to inquire whether the uncle handed the key over willingly or if Bob just lifted it from the nail where it hung between seasons. The faith and confidence which boys have in one another is beautiful and touching.

"Financially we were a decidedly limited company, but we were long on faith and optimism and lightly brushed aside the foolish remonstrances of our respective parents at the prospect of tramping the entire distance. All our available cash was spent for ammunition. Food and other supplies were requisitioned from the family supply.

"We started off blithely about 6 a. m., each man burdened with a load that would have taxed the endurance of a Missouri mule. Looking back now at the episode I doubt if the three of us together had as much sense as one of these hee-haw descendants of Balaam's familiar.

"In addition to a miscellaneous collection of food rolled in a blanket, I had a teapot and a tin mug. As behooved hardy and adventurous frontiersmen we saw no reason for burdening ourselves with plates, cups and saucers or knives and forks. We confidently expected to secure all our fresh meat as you might say while it was fresh. I carried a little .22 rifle in the crook of my arm, a long hunting knife in a sheath on one hip and a hatchet on the other. Bob and Jim were similarly burdened with the single exception that Bob had a coffee pot and a big rifle designed for shooting moose, while Jim had the frying pan and a double barrel 16-gage shot gun."

"I can understand why you took most of the rigging," I said, "but what possible use did you expect to have for the moose gun?"

"Search me," said Bill. "Did you ever know a boy who had a logical reason for anything he did? Bob always was a queer kind of a bird. At one of the many stopping places on the journey he horrified us by offering to shoot a prize bull quietly grazing in a field. The fact that the bull was not a game animal in the generally accepted sense of the term, that he probably was the apple of some farmer's eye and that in all probability we should spend the remainder of our lives in a penitentiary apparently meant nothing in his young life. He (Bob, not the bull) eventually grew up and became a druggist and changed the name of his establishment to Pharmaceutical Hall. In a true scientific spirit he conducted a series of exhaustive experiments on the effects of spiritus frumenti on the human system and died nobly in the horrors, another martyr on the altar of science.

"However, all that is far away and long ago and has nothing to do with the present story. Many times since then I have read of men who crossed Africa on foot; hardy old sourdoughs who mushed over the Chilcoot pass in a search for gold in the great lone land under the streaming banners of the Aurora; adventurers who scaled the Andes and

THERE'S A LONG, LONG TRAIL A WINDING

followed the course of the Amazon to the sea. Pikers, my lad pikers every one of them.

"We walked 15 miles that day. Not your ordinary mile divided into 8 furlongs; 320 rods, poles or perches; 1760 yards or 5280 feet. The only way to realize the length of these miles is to reduce them to inches, 63,360 to the mile. When we started the loads were not extraordinary, but believe me, long before we arrived at our destination they were about as light and convenient to handle as the ball on a skull cracker. Talk about your permanent wave. I had a permanent kink put in me that day which I never have outgrown. Subsequent experience in the foundry conferred a hump and a pair of bandy legs, but that walking experience gave me a flying start.

"Fortunately, the days are long in July. This one, by the way, was the longest I ever have known either before or since. Long as it was we made the last mile along a narrow path through the woods by the flimsy light of the moon. A stroll through a leafy glade by moonlight and under certain circumstances is an alluring prospect. A little hand resting confidingly in the crook of your elbow, a faint odor of heliotrope and the wish in your mind that you two could wander thus forever in an atmosphere of illusion, magic and romance is something to treasure in after days.

"Try it some night, my lad, with a ton of pig iron on your back, with blisters on your soles and heels, with every exposed inch of your person chewed up with the flies. The memory of one experience may not be as sweet as the other, but I'll bet you a dollar and a quarter right now that it will last just as long and perhaps just a little longer."

"Oh! for heaven's sake," I said, "Cut out the Laura Jean Libbey, Meet-Me-by-Moonlight-Alone stuff and stick to the story. At the rate you are going it will be bed time before you reach the camp and then I'll never know whether or not you ever made the return journey. Naturally, since you are here I must assume you did, although I should not be at all surprised if you tell me that you dropped dead on the threshold of the shooting lodge."

"Tut, tut!" said Bill. "Be calm, my dear. Restrain yourself. Keep the jolly old shirt tucked inside the waistband. We did not have to walk back. We returned in style and a fair degree of comfort in a grocer's delivery wagon. Even had we been forced to walk home the experience would not have been so severe because we had eaten all the food and our loads would have been lightened to that extent.

"When I say we had eaten all the food, I mean it literally down to the last crumb. The lad who had promised to call for us with the grocery wagon was delayed two days beyond the date set and we almost had decided to throw away all our equipment and start light when he finally appeared.

THE HORN OF THE HUNTER IS HEARD ON THE HILL

"On the day after our arrival in camp we had pooled all the food and then had eaten our way through it according to the line of least resistance in the way of cooking and according to our predilection for the best things first. Among other things Jim had brought a small box of dried herrings and a package of pilot biscuits about as hard and edible as so many paving stones. By common consent we avoided them until the last. On the last two days we had to eat them. I never have wanted to see one since.

"One night in camp we spent an hour wondering how the cast-iron kettle was made, but several years elapsed before I learned the proper answer. Of course it was a cast iron kettle and heavy. Modern aluminum kettles are not so heavy, but they are made after the same fashion.

"Two methods are available for molding aluminum kettles and the method adopted depends on several factors including the anticipated output, the appropriation which may be invested in pattern and flask equipment and the class of labor to be recruited in the vicinity.

"One method is that which has been used for many years in the gray-iron foundries. The pattern and flask equipment is comparatively inexpensive, but the output is limited and the making of the molds demands a high degree of skill on the part of the operators. A light touch and a certain deftness of hand and eye have to be developed, and this training period usually occupies several months. The time of course will vary with several men. Some men never can acquire it, while others develop rapidly. The sand must be tempered to a nicety and must be rammed within exceedingly narrow limits of density and these are points that only may be acquired through experience. If the sand is too damp the metal will not lie against it quietly and if it is too dry it will not *lift* clean and in addition it will wash, particularly at the gate. If the sand is too hard the metal will *kick* and cause bubbles and cold shuts. If it is too soft the pressure of the metal will compress it. The casting will be too thick and will be over weight. Experienced molders develop an instinct or intuition in deciding these points, but naturally they experience difficulty in transmitting this peculiar type of knowledge to others. The only way to learn is to practice, to watch carefully cause and effect until competency is acquired.

"The pattern and flask equipment includes a pattern in two parts with the joint line along the bilge or largest circumference and continuing along the center line of the spout. A follow board to support the dome or bottom half of the kettle and built up to follow the contour of the half spout. A cope and drag flask. An arbor for the core and a flat *wedge* gate which is placed on the bottom or highest part of the pattern.

"Round or square flasks may be employed, but at one point on the round flask or at one corner of the square flask, the joint is cut to conform to the curve of the spout. Each man will require one pattern, one follow-board and one gate and from 20 to 30 flasks and the same number of arbors. The total number of complete outfits required will depend on the volume of orders.

"In making the mold, the dome half of the pattern is placed on the follow-board followed by the cope half of the flask. Sand is sieved over the pattern and the gate is tucked in place with the fingers. The cope contains no bars and the sand is rammed with the shovel handle or a light rammer. The sand is struck off flush and the flask and follow-

board are rolled over with the gate still in place. The second half of the pattern then is adjusted in place and a little sand is placed in the inside. The arbor then is tucked in place. This arbor has a long stem with a slot at one end for a cotter pin and four members projecting at right angles in the form of a cross at the other end. The cross is small enough to pass through the opening in the kettle which later will be covered by the lid.

"Sand is rammed around the outside of the pattern to hold it in place and then the inside of the pattern is packed full of sand by the hand. The drag carries a single cross bar with an opening in the center through which the slotted end of the arbor stem projects. The remainder of the drag then is rammed full of sand and struck off flush after which the drag is lifted off and the bottom half of the pattern is removed. The drag then is replaced and a key is driven through the slot in the arbor stem to anchor it to the drag and prevent the core from floating under the pressure of the metal.

"The entire mold then is rolled over. The cope is removed and the molder slicks the edges of the gate with a tool to make the sand firm enough to resist the rush of the iron and insure a clean break. The gate then is withdrawn and the upper half of the pattern is removed carefully by inserting the point of a draw spike in a suitable hole. A little blacking is dusted on the mold from a bag and the flask is closed and clamped. The mold is poured from a hand ladle with exceedingly hot iron. A certain knack also must be acquired to do this properly. If the iron is poured too slowly the casting will show cold shuts and if it is poured too rapidly the casting will be strained. Deftness, skill and a happy and intuitive knack of correlating every feature in the sequence of operations are essential to success.

"In the second method, more elaborate pattern equipment is required so that two men or a man and a boy may work together and utilize two molding machines. The boy simply makes the copes from a plain dome and half spout mounted on a pattern plate. The second half of the pattern is the same as outlined in the first instance and is doweled to a pattern plate containing a cavity conforming to the shape of the inside of the dome or upper half of the kettle.

"The cope machine may be a plain jolt or squeezer with a device for dropping the pattern about 1 inch before the cope is lifted. The drag machine may be a combined jolt and squeeze rollover. The procedure of making the mold is the same as in the first instance. After the mold is rammed the drag is lifted and the loose part of the pattern is removed. Then the drag is replaced, the key is inserted in the arbor spindle and the table of the machine is rolled over and then the table is lifted or it may remain stationary while the mold is lowered away from it on a suitable device. The drag then is placed on the floor and the cope is placed on top of it. In this way the work is divided among two men, neither of whom needs to be so highly skilled as where one man does all the work himself.

THE END OF A NEARLY PERFECT DAY

"This second method lends itself more readily to places where unskilled labor must be broken in rapidly, but in either case the pattern and flask equipment must be made and fitted with the greatest accuracy. The wall of the casting is so thin that the least *shift* in the pattern or flask will cause the sand to cut through.

"The first or master pattern and core box are made from wood in the usual manner. From this one or more working patterns depending on requirements, are cast in white metal, aluminum or gray iron. Since a trifling reduction in the size of the casting is not an important factor, it is immaterial whether double shrinkage is allowed or not allowed on the master pattern. A patternmaker who is a stickler for accuracy will insist on the double shrinkage allowance, but for all practical purposes a 4-quart kettle is a 4-quart kettle even if it holds only 3 99/100 quarts. They never are filled to the lid.

"The pattern may be cast in two parts, that is in the shape in which it is to be used, or, it may be cast as a completed kettle and then sawed in two along the joint line. In fact a great deal of patternmaking expense frequently is avoided by securing an existing kettle and sawing it in two for a pattern. Where the two parts are cast separately it is optional whether the spout is cast on, or brazed on afterward. Where the spout is omitted the two halves may be turned nicely in the lathe and provided with a male and female joint, and with a single dowel pin to locate the parts accurately in relation to the spout. This type of pattern may be formed on a press or *spun* on a lathe from a suitable thickness of plate. The only patternmaking work will be in attaching the spout and the lugs for the lid.

"In this case the patternmaker is almost as unnecessary as a certain young colored bucko at an open air revival meeting. One of the elders noticed this lad leaning against a fence, idly whistling and apparently paying no attention to the exercises. 'Bruddah,' said the elder, 'Ain't yo' cravin' to save yo' soul?' 'Naw,' says the unregenerate one in a deep rumbling voice. 'Whyfo' yo' come heah den fo,' persisted the shepherd in an aggrieved tone. 'Oh!' our hero returned carelessly, "Ah jus' perambulates roun' promiscuous lak to hug and kiss de gals and sing bass in de halleluyah chorus!'"

Receives Appointment

Francis Hodgkinson, for many years chief engineer of the South Philadelphia Works, Westinghouse Electric & Mfg. Co., has been appointed consulting mechanical engineer for the organization as a whole. About a year ago Mr. Hodgkinson was awarded the Elliot Cresson gold medal by the Franklin Institute in recognition of his scientific achievements. The position of chief engineer of the South Philadelphia Works is discontinued and that of manager of engineering created. A. D. Hunt will fill this position.

The Western sales office of the Sullivan Machinery Co., Chicago, have been moved from the Hutton building to larger quarters at 120 South Lincoln street, Spokane. The display room and warehouse will be maintained at the new location.

How and Why in Brass Founding

By Charles Vickers

Too Much Deoxidizer

We forward for your inspection two samples from brass castings, the broken surfaces of which show a very mixed fracture of a brick color. The larger sample in addition to the brick-colored spots contains a black substance, and both of these inclusions we would like to have identified, and the cause thereof explained. We are melting in noncrucible furnaces of the horizontal cylindrical type and use charcoal on the metal, as well as a proprietory flux. We pour from a No. 70 crucible and place 1 ounce of phosphor copper, 1½ pounds of lead, 3 pounds of zinc and some charcoal in the bottom before pouring the metal in. The metal is stirred and skimmed well. The castings must stand water pressure, and the alloy is ounce metal ingot, with a certain amount of our own turnings, gates and scrap.

When an alloy like *ounce* metal presents the mixed fractures shown by the samples it is either not handled properly in a metallurgical sense, or it contains the impurities known as *deoxidizers* in too large amount. The addition of one ounce of phosphor copper to around 200 pounds of alloy is not too much. It is possible the ingot metal may oe at fault, in which connection an analysis would be helpful. Lacking this, simply pour a bar about 6 inches long and of rectangular cross section; about 1½ by 1¼ inches. When cold, saw across one long side to a depth of ¼-inch, and break the bar. If the fracture is homogenous, the ingot is not to blame, and the trouble is due to wrong handling while melting, or pouring.

The furnace of the type mentioned is efficient and will produce good metal. It will melt rapidly and give hot metal which is required particularly for pressure resisting castings. The additions of lead and zinc though, ought to be made in the furnace. Put nothing into the pouring crucibles except the phosphor copper and possibly a little charcoal if it is considered necessary. Do not stir and skim so much. The metal is cooled off greatly before it gets to the molds. It has to be poured at a cheerful heat, that is it must on no account look dull. The black spots in one of the fractures look more greenish, and these are caused by cool pouring. The brick red spots are caused by too much phosphorus, or too much of any so-called deoxidizer. The alloy is better without such as a general rule.

Requests Data On Tin

Will you advise if there is any advantage in using Banca tin in making bronze castings over the ordinary brands such as generally used for foundry work. One reason we request this information is that our foundry foreman claims there is a tremendous difference in pig tin, which affects the soundness and freedom from porosity of the castings, and we wish to be certain before standardizing on Banca as the cost is higher.

The only manner in which one brand of tin can differ from another brand is in the number and amount of impurities contained. In making bronze or red brass for castings, lead would not be harmful if present to the amount of two or three per cent, but it would not be tiny. The impurities that would be harmful are antimony, bismuth and arsenic. The first two metals would have a harmful effect in making bronze of high physical properties that must meet high specifications. Arsenic would be harmful in making alloys with 30 per cent and over of lead, as it would cause *blooming* if high in amount. Any brand of tin containing 99 per cent tin and over is satisfactory for making ordinary bronze. It is obvious that a metal of such purity cannot contain sufficient base metals to work any harm in ordinary bronze. In the case of secondary tin it would be using common sense to have an analysis made of every shipment with particular reference to lead, antimony, iron, arsenic. As bismuth costs several times more than tin, no one is going to add it deliberately, so it is likely to be no higher than it was in the original new metal. If lead is present to the amount of ten per cent, for instance this ought to be known, as it will have to be allowed for where particular requirements have to be met. There might also be zinc in re-run tin, also aluminum, but they would be accidental impurities, as it would be silly for the smelter to add them deliberately.

Chills Cause Blows

We have experienced difficulty with small air compressor heads of bronze which weigh about 100 pounds. We find it necessary to use chills to prevent leaking of the castings and we sometimes lose four out of six castings due to blowing off the chill, although we have tried everything we could think of as a coating for the chill. In damp weather we experience much more trouble than in dry weather, sometimes we lose few castings on dry days, but whenever the weather is rainy and humid the losses increase. We believe the chills draw dampness on such days and desire to get your opinion in this matter.

When the chills are cooler than the sand of the mold the metal surfaces will condense the moisture that arises from the damp sand and droplets of water will form thereon, that the liquid metal will change to steam, which cannot escape any other way than by passing through the metal itself, thereby aerating it and producing holes. It will be obvious that simply coating the chill can have no effect whatever on the condensation of the moisture as the coating does not heat the chill, being only a thin film it can have no effect in preventing water condensation. When the chill itself is cold, the latter will penetrate the coating and produce a cool surface. In dry weather there is less condensation on the chill and as the mold slowly fills, the heat of the molten metal drives off the moisture as steam before the metal comes into contact with it.

It is merely a question of temperature; the chills cannot "draw" moisture, they condense the moisture present in the mold and on rainy and humid days there is more moisture than on dry days. This increases the condensation of water to the point where it works harm. The remedy is to have the chills warmer than the atmosphere of the mold and some means of heating them should be studied out. We suggest leaving the molds open until casting time, then with a torch heat the chills until moisture will sizzle when dropped on them. Close quickly and pour before the chill can cool off. The easiest method to adopt will depend on local conditions.

Recommends Tests for Cast Iron Welds

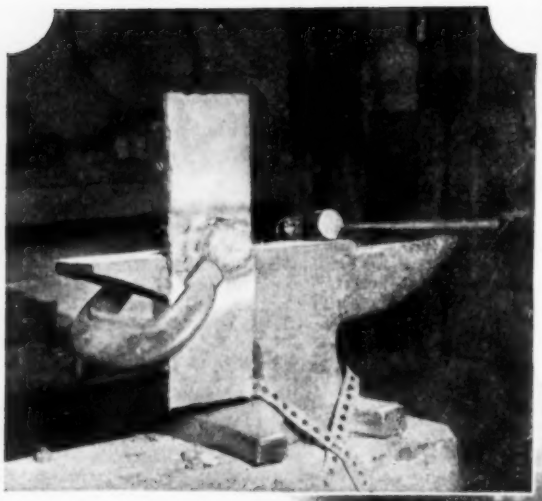
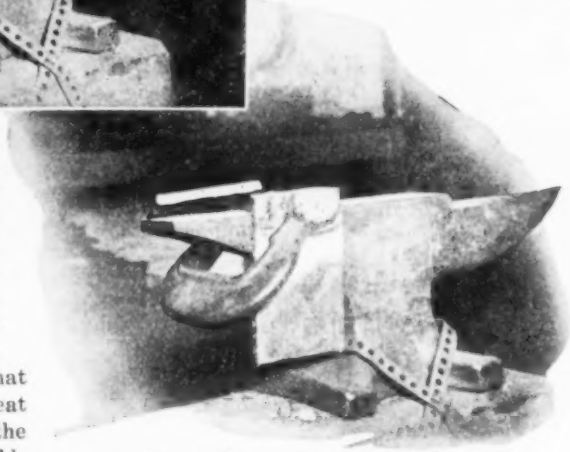


Fig. 1 (Left)—A Welded Specimen Clamped to an Anvil. Fig. 2 (Below)—The Test Piece Broken



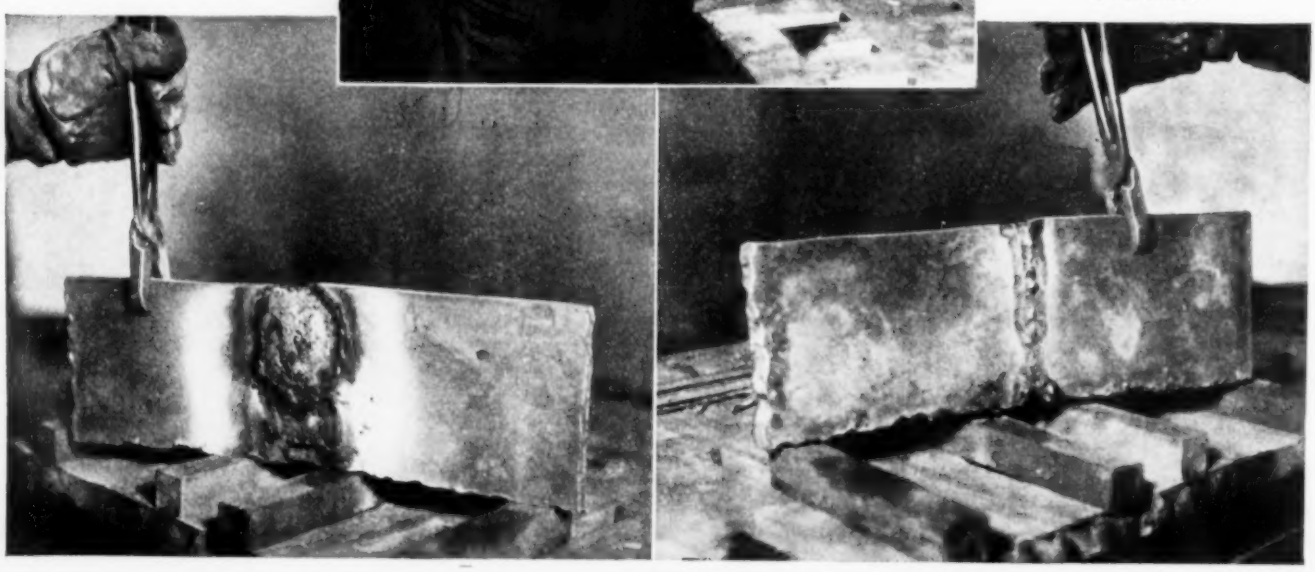
MUCH of the work done in a shop specializing in repair welding is on cast iron. This is not surprising, as cast iron is used so widely and under such varying conditions. This condition means that welders must give a great amount of attention to the subject of cast iron welding, either with the cast iron rod or with bronze, according to a recent article in *Oxy-Acetylene Tips*. Much has been written on the correct practices in this work and any welder who desires to improve his technique may obtain reliable information from several sources, especially from the manufacturers of welding equipment. However, the question often arises as to how the operator may know when his technique is faulty? How can he know when his faults are corrected? The answer is evident. Each operator should test specimens of his work on cast iron to determine what results he is obtaining.

Such testing has several beneficial effects. It serves to confirm in the mind of the operator who is doing the work the fact that his welds are of high quality. It will indicate to the man who is falling a little short of perfection where his main difficulties lie. Welding and testing of welded specimens by the operator is not an admission that he thinks the welds may be bad, but is an indication that he is doing his best in every way possible to turn out welds of high quality on all work he undertakes.

It is relatively simple to test specimen welds. No elaborate equipment is needed as the tests are made with the ordinary equipment in the shop, with the possible addition of a magnifying glass such as may be bought at any stationery store. Test methods in general use are as follows: Obtain some pieces of scrap cast iron. Set them up with the edges cleaned and prepared for welding, as normally would be done, and weld two of the pieces

Fig. 3 (Right)—Welding the Cast Iron Pieces. Fig. 4 (Below)—Top of the Practice Weld

Fig. 5 (Below)—The Bottom of the Welded Specimen Showing How the Metal Should Penetrate



together, using the same technique and practices which regularly are employed. Use the welding rod which is being used in the shop, which should be the best procurable. The correct tip size and gas pressure for the thickness of metal being welded should be used. When the weld is finished, allow it to cool slowly, covering it with the material used in the shop for slow-cooling cast iron parts. After the weld has been cooled properly, brush the surface on both sides with a wire brush and examine the weld carefully. It is especilly important to notice the appearance of the weld on the under side. If thorough penetration and fusion between the edges at the bottom of the crack have not been secured, it may be noted easily. The bottom of a good weld should look something like the piece shown in Fig. 5. Notice the little round beads of metal protruding through, indicating that the operator has secured a good bond all of the way to the bottom of the crack. Small blowholes or other irregularities sometimes may be seen on the upper side of the test weld. If the joint is reinforced to a point where blowholes are ground away, the defects may be disregarded. However, if the blowholes extend below the level of the original metal, they represent something to think about the next time a weld is made.

The welded specimen next is clamped in a vise with the weld flush with the top of the jaws, and the end struck with a sledge a sufficient number of times to break the test piece. These blows should be struck on the side of the material which was welded so that the top of the weld will be stretched. If the weld is good, the break will come in the cast iron and not in the weld. If the break comes where the weld metal and the base metal join, it probably indicates that the edges of the joint were not heated properly during the course of welding, or that the molten metal was blown ahead on the cooler surfaces. Examination of the break in such a piece with a magnifying glass may show the defects which caused the start of the fracture, such as an inclusion of slag particles, blowholes or sections of the base metal which evidently have not been melted.

If the test piece breaks outside of the weld, the piece should be turned over and the other side of the base metal broken off. This will leave a strip having the weld metal down the center. This should be clamped in the vise and broken to obtain a fracture across the weld. It may be necessary to nick both sides of the piece with a hacksaw to start the break, but if the weld is good, the weld metal will be stronger than the same section of the orginial cast iron.

The break across the weld then should be examined carefully with a magnifying glass. There will be some difference in the appearance of the weld metal and the adjacent base metal. However, in general both metals should exhibit the structure, luster and color of gray cast iron, and there should not be a sharp dividing line between the base metal and the weld metal. There seldom will be any impurities between the base metal and the weld metal in a section broken in the manner described, because the presence of impurities would have caused a fracture the first time that the metal was hammered. Slag or oxide inclusions or a series of blowholes along the line of juncture between the weld metal and the base line indicate a poor spot in the weld.

If the test piece is too heavy or too large to put in the vise, it may be clamped on the side of the anvil as shown in Fig. 1, or supported on two bars or rails and sledged from the top. Any convenient method which will result in the desired break, will be satisfactory. A piece of cast iron welded with bronze also may be tested in practically the same way. While the weld metal will be different, if improper methods were used, a collection of impurities along the junction of the weld metal and the base will cause initial fracture and even a splitting at the contact. If the weld has been made properly, the cast iron should break rather than pull away from the weld metal. In testing bronze welded pieces, it often is a good plan to cut across the weld with a hacksaw instead of attempting to break the weld in the vise. The latter method gives a better surface for examination. These tests will indicate that if welds are unsatisfactory, the poor quality may be due to one or more causes. Either the welding was too fast and the proper fusion was not secured between the molten base and the molten weld metal; or complete penetration was not secured to the bottom of the break; or the welding rod was unsatisfactory; or sand and slag were not worked out properly. Possibly the break may have been caused by the piece cooling too rapidly, a condition indicated by a hard and brittle weld. When the trouble has been found, it is not difficult to avoid a similar condition.

Faked Foundry Facts

Skin Drying

Makes Several Changes

Timken Roller Bearing Service & Sales Co., Canton, O., has appointed H. E. Gilmore, formerly of the Chicago branch, as manager of the St. Louis branch. G. W. Curtis, formerly industrial equipment engineer, has been appointed district sales manager, industrial division, Milwaukee territory. S. M. Weckstein succeeds Mr. Curtis, G. W. Richards and A. R. Spicacci have been appointed assistant engineers to assist Mr. Weckstein.

The Omaha branch office has been removed to 2240 Douglas street. A change also has been made in the location of the Los Angeles branch office. This office is now at 1361 Figueroa street.

Receives Appointment

J. C. Keplinger was appointed advertising manager of the Timken Roller Bearing Co., Canton, O., on May 1. Mr. Keplinger has been with the Timken organization for about four years in the production department.

Patternmaker Uses Files *on* Wood and Metal

By Walter C. Ewalt

SCRAPING tools used by the patternmaker include files, rasps and scrapers for iron, wood and wax. Files and rasps also may be called cutting tools because the hardened steel instruments have cutting ridges or teeth for abrading. Rubbing, smoothing and cutting are accomplished with these tools. While the metal patternmaker finds more use for the file than the wood patternmaker, the latter must use this tool in filing dowel pins, metal mounted patterns and core boxes and for many other operations in making of wood patterns.

A number of different shapes of files are shown in the accompanying illustration and the names under which these are known, are as follows: Fig. 1 the triangular, a three equally sided file, generally used for filing saws; Fig. 2, the flat file; Fig. 3, the square file; Fig. 4, the round file; Fig. 5, the half round file; Fig. 6, the regular pillar file; Fig. 7, the warding file; Fig. 8, the knife file and Fig. 9, the rasp.

Many other shapes may be secured, such as cruciform, ear shapes, oval, round edges, lozenge, diamond shapes, equaling barrette, joint, slitting, marking crochet, regular, slim and extra slim taper, etc.

Aside from their length, the form of cross sections and shape, files also are distinguished by the kind and fineness of their teeth. The kind of teeth is more important in the majority of cases, than the other characteristic because the different metals require various sizes and shapes of the teeth. These factors also regulate the amount of metal taken off by the strokes. In addition to being identified by the previously mentioned, files also are known or classified by the shape and kind of teeth, as first single cut second double cut and third rasp. These names refer to the manner in which the teeth are formed or cut on the blank steel.

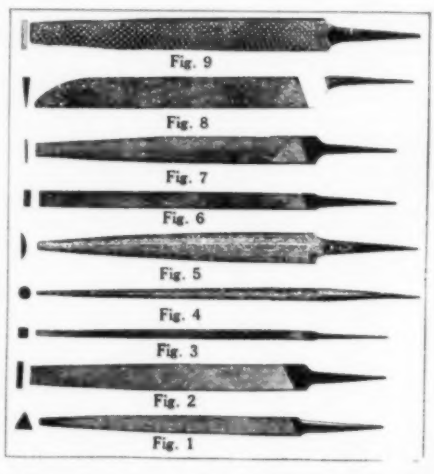
Single cut files have the teeth cut obliquely across the width of the files and the angles vary from 5 to 20 degrees according to the purpose for which they are used. The double cut files have two courses of teeth cut obliquely across the files, one of which crosses the other. The first cut is at an angle of 35 to 55 degrees and the second cut crosses the first cut at an angle of 5 to 15 degrees.

The files are further subdivided as for example the single cut is made up as smooth, second cut, bastard, coarse and rough and the double cut as dead smooth, smooth, second cut, bastard and coarse. The rasp shown in Fig. 9, is made of individual projections or teeth and is classified as smooth, second, bastard, coarse.

Instead of these terms, some makers use numbers running from No. 00 to No. 8, No. 00 being the bastard and No. 8, the dead smooth.

Others terms used are bellied, which means that the file is large in the center, and blunt which is a file having the same width throughout its length. The tang is that pointed end over which the handle is placed. When a file is measured, the tang is not included in its length.

Some makers of files make the teeth as regular as possible while others intentionally make the spacing irregular. In that case the teeth are not exactly parallel and are not of the same in height. The various manufactures advance theories as to which is the best method. However, the best way to test files is to use them and find out which lasts the longest under similar conditions.



FIGS. 1 TO 9—A FEW OF THE MANY TYPES OF FILES WHICH MAY BE USED BY THE PATTERNMAKER

Many of the cheaper files are crooked, probably in hardening and while, for some work, are good enough, a metal patternmaker objects to these for particular jobs. Like many other things, the best is often the cheapest in the end.

It is rather needless to state that since files are tools having sharp teeth, they should be handled carefully. Instead of carelessly bunching and throwing them together, they should be placed in separate compartments or hung on a rack. It is claimed that a greater degree of accuracy and finer finish may be obtained with a file and scraper than with other means. If this be true obviously much practice and a certain amount of skill are necessary to handle the file properly. The correct method of holding a file is important. If it is necessary to rough the job with heavy strokes, the right hand grasps the handle with the thumb up and in line with the file, as shown in Fig. 10. The position of the left hand in this operation also is shown. For lighter strokes, the thumb and fingers of the left hand may be held as shown in Fig. 11. In draw filing, the hands are held as in Fig. 12. When the point of the file cannot be held with the left hand, the file is grasped with left hand as in Fig. 13. Where it is necessary to use one hand, owing to the place or the necessity for light strokes, the hand is held so that the first finger presses down on the file as in Fig. 14.

Many filers prefer the square file for roughing and heavy filing because, it is narrow and bites and cuts into the work with less pressure. This type also is stiffer and has more belly than other files which makes it easier to handle and faster in operation. Many also prefer the square file to

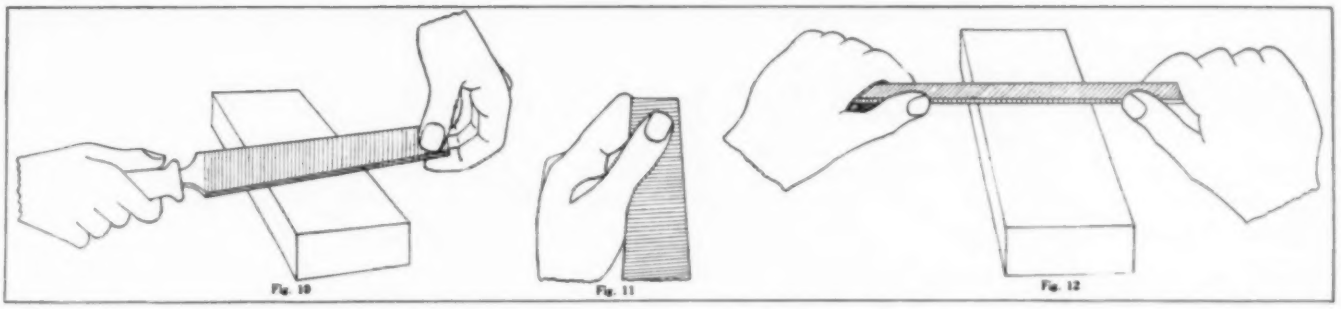


FIG. 10—USING BOTH HANDS ON THE ROUGHING STROKE. FIG. 11—HOLDING THE FILE FOR THE LIGHTER STROKES. FIG. 12—POSITION OF THE HANDS FOR DRAW FILING

the half-round file in roughing out concave surfaces.

In using the file in cross filing, which amounts to pushing the file forward on the work, all cutting work is accomplished on the forward stroke and on the back stroke the pressure is relieved, although the file is not raised or removed from the work. In case two hands are used, the left hand bears downward with considerable pressure on the forward stroke and the right hand drives the file forward and guides it at the same time. As the stroke continues across the work, the left hand gradually relieves the pressure and at the end of the stroke, the action of the hands are reversed, the right hand pressing down hard and the left holding the file at the proper angle. This is accomplished by practice and prevents the file from rocking. The file also is made with a belly, so that straight filing may be done. If the file was absolutely straight, it would be difficult to file straight due to the swing of the arms.

If a flat surface is to be filed, the workman files across the first time in one direction, for example toward the left and the next time across toward the right, thus crossing the file marks. By doing this he may see where the file is cutting, as is shown in Fig. 15.

Often when filing a surface which must be accurate and also smoothly finished, the file is pushed in a line at nearly right angles to its length. This operation is called draw filing. The file is held at each end and pushed sideways over the work, as in Fig. 12. Although less metal will be taken off, the file may be controlled better, the high spots taken off and the rocking of the file prevented much. The criss-crossing of the marks of the file also is applied in draw filing.

In filing the different metals, the new file should be first used on brass, then on cast iron and then on steel, then on rough castings to remove the sand and scale.

Cabinet files and rasps are wider and thinner than half-round files and are bastard double cut, second cut and smooth. The wood rasps are coarse, bastard, second cut and smooth.

Files and rasps should be examined carefully as many of the cheaper kinds are warped and useless for certain kinds of work.

Wooden Soldiers Cause Lost Castings

Question: We have been asked to replace a casting for a pile driver follower cap, made in an outside foundry, which broke into several pieces shortly after being placed in service. The iron appears to present a normal fracture so far as the grain is concerned, but the casting is completely honeycombed with miscellaneous shaped cavities and small and large pieces of irregular shaped shot. We are at a loss to account for this condition and will appreciate an expression of opinion. We are forwarding a small piece of the casting for your inspection.

Answer: If you had forwarded a sketch of the casting and the manner in which it was molded we would be in a better position to diagnose the cause of the trouble. However, the general characteristics of the cavities and the pieces of shot iron indicate that they were caused by a piece of wood in the mold. This piece of wood may have been shoveled in with the sand, or it may have been set as a soldier. In either case it approached the face of the casting too closely and started to burn when the mold was filled with iron. Hard sand and wet sand will cause blowholes and shot. Gas from cores will do the same thing. Slag inclusions produce holes in a casting and so does oxidized iron. Sometimes several of these factors may be responsible and an intimate and detailed knowledge of every feature connected with the molding and pouring of the casting is required to enable a person to draw intelligent conclusions. In the present instance we are basing our opinion on the burnt wood theory because the various shot inclusions are soft. Shot from any other cause invariably is hard and usually chilled.

Competition Increases

According to recent reports eastern Pennsylvania pig iron producers almost have been forced out of the New England district due to the keen competition offered by the furnaces in the adjacent state of New York, and foreign iron. The competition between the producers of pig iron for business should be beneficial to the New England foundrymen as it tends to make prices more favorable. It is expected that the foundry business in that section will improve greatly.

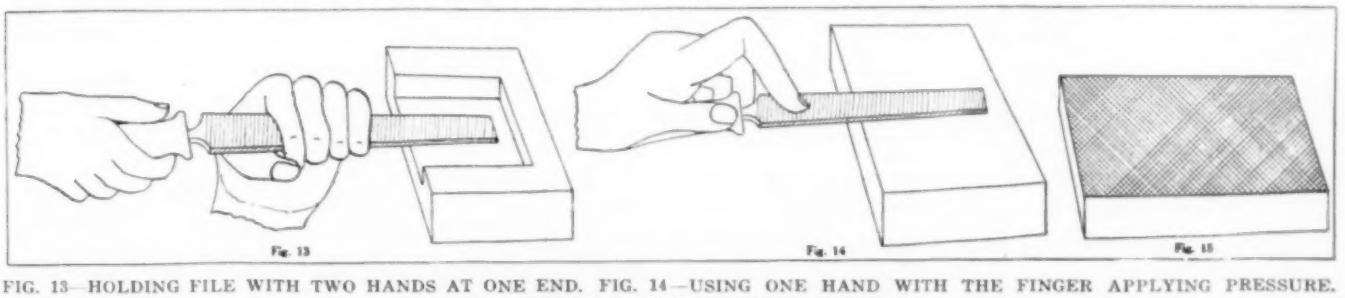


FIG. 13—HOLDING FILE WITH TWO HANDS AT ONE END. FIG. 14—USING ONE HAND WITH THE FINGER APPLYING PRESSURE. FIG. 15—METHOD OF FILING ACROSS THE WOOD

The Shakeout

DAN M. AVEY, Editor

PAT DWYER, Engineering Editor
FRANK G. STEINEBACH, Associate Editor

CHARLES VICKERS, Nonferrous Editor
EDWIN BREMER, Associate Editor

¶ Jumping To Conclusions

EVERY person is familiar with the story of the three blind men in India who were asked to examine an elephant and then describe the appearance of the animal. The first man approached the animal from the front and laid his hands on the trunk. He said the elephant resembled a snake. The second man approached the beast from the side and happened to take hold of one of the legs. In his estimation the animal resembled a tree. The third examiner tap-tapped his way to the rear and happened to catch the elephant's tail. He triumphantly declared that the animal strongly resembled a piece of rope. The world is filled with figurative descendants of the three blind men of India.

IN A recent edition of a foreign newspaper, a returned foundryman is quoted on his impressions gained on a tour through the foundries of the United States. In none of the foundries he visited did he see any examples of loam molding, therefore he concludes that this highly meritorious method of making castings, particularly large castings, is unknown in this country. The greater part of his report indicates that he is a keen observer with a thorough grasp on the principles and practice of the foundry industry and it is to be regretted that he jumped so hastily to such an erroneous conclusion, based on the meager evidence at his disposal. He visited perhaps 20 foundries out of a total of nearly 7000 in the United States and Canada and because he saw no loam work going forward in any of the 20 on the day he happened to be present he concludes that foundrymen in this country are decidedly behind the times.

LOAM molding is not practiced to such an extent here as it is in some European countries. Many large castings are made in dry sand and even in green sand that would not be attempted in these mediums over there. Under certain circumstances many large and difficult castings are made entirely in an assembly of dry sand cores. Castings that would tax the skill of the most competent molders are produced by a crew of helpers under the direction of one skilled man. However, that is far from saying no castings are made in loam molds. To mention only a few foundries taken at random, if the tourist had visited Builders Iron Foundry, Providence, R. I.; The Farrel Foundry & Machine Co., Ansonia, Conn.; The Buffalo Foundry & Machine Co., Buffalo; Dominion Engineering Works, Montreal; Kilby Mfg. Co., Cleveland or the Allis-Chalmers Mfg. Co., Milwaukee, he could have seen examples of loam work equal to anything made in Europe.

¶ Castings Output Increases

STEEL castings production increased 11.9 per cent in 1925, over the output for 1924, according to a report of the American Iron & Steel institute. Last year the total was 1,252,786 gross tons, compared with 1,120,782 for the preceding annual period. The 1925 tonnage is the largest since the war, excepting 1923, which with the total of 1,458,031 tons established the high point for all time.

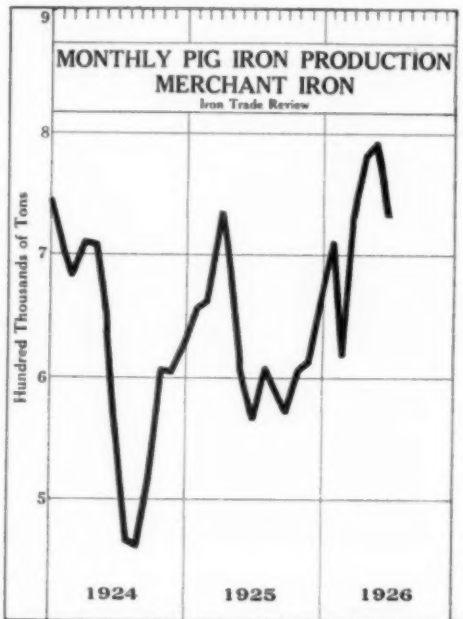
ELECTRIC steel castings showed the most decided advance in 1925. The total tonnage of this class of castings produced last year was 279,534 compared with 206,549 tons for the preceding year. This shows a gain of 39 per cent and the 1925 output was the largest recorded since statistics have been compiled. In open hearth furnace steel castings the increase in total production during 1925, over the previous year was 6.8 per cent. Of this, the greatest gain is found in acid type castings which increased 14.8 per cent in 1925 bringing the output to 462,303 tons compared with 402,901 tons for 1924. Basic steel castings encountered a fractional per cent loss. The total output for this type of furnace was 455,282 tons or within approximately 5000 tons of the total output of castings from acid lined furnaces. Bessemer steel showed a slight increase from a total of 53,437 tons in 1924 to 53,834 tons last year.

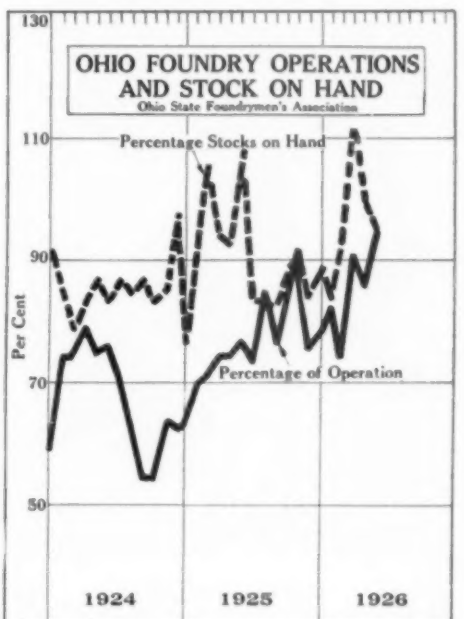
Trade Trends in Tabloid

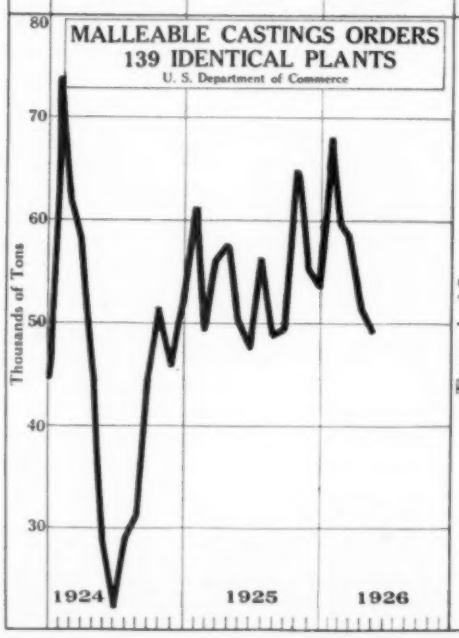
PROSPECTS for railway buying are brighter than for many months. Freight car loadings are running ahead of corresponding periods last year, while the surplus of cars in good repair has declined. Foundries have bought tremendous tonnages of iron during the past few weeks. The June sales of foundry pig iron in the Chicago district have been 30 per cent ahead of June last year. While automobile sales have tapered off, slightly, many jobbing foundries making miscellaneous gray iron automotive castings are exceptionally busy, in some cases working 12 hours instead of 8 hours a day. General jobbing business, in keeping with the customary summer decline, is slightly slower. Building activities are well sustained. May recorded the highest total of any corresponding month in history. June pig iron production of 3,232,478 tons showed a decline, compared with the May figure of 3,477,820 tons, according to the *Iron Trade Review*. Total merchant iron production was 734,823 tons, which on a daily average basis is 24,494 per day, compared with 25,727 tons per day for May. Average monthly prices for nonferous metals in New York, according to the *Daily Metal Trade* follow: Casting copper, 13.421c; electrolytic copper, 13.907c; Straits tin, 60.732c; lead, 8.062c; antimony, 11.257c; aluminum, 98-99 per cent, 27.00c. Zinc averaged 7.119c. E. St. Louis, Ill.

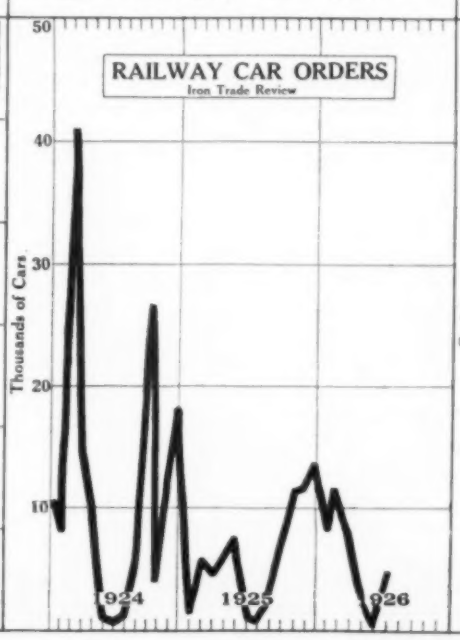
RAW MATERIAL PRICES
JULY 7, 1926

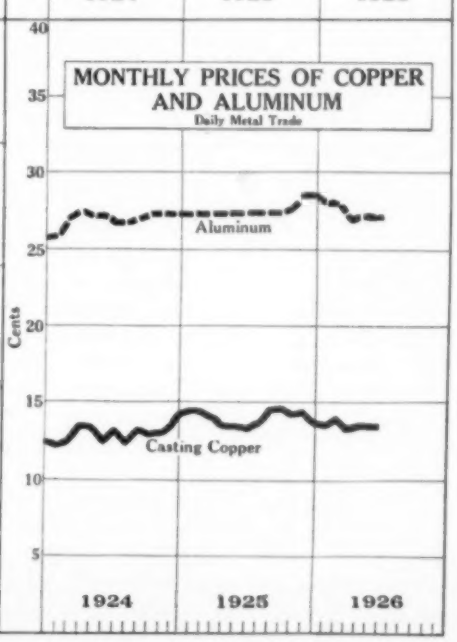
Iron	
No. 2 foundry, Valley	$18.00 to 18.50
No. 2 southern Birmingham	21.00
No. 2 foundry, Chicago	21.00
No. 2 foundry, Philadelphia	21.76 to 22.76
No. 2 foundry, Buffalo	20.00
Basic, Valley	17.50 to 18.00
Basic, Buffalo	19.00
Malleable, Chicago	21.00
Malleable, Buffalo	20.00
Coke	
Connellsville foundry, coke	$4.00 to 4.50
Wise County foundry, coke	4.25 to 5.50
Scrap	
Heavy melting steel, Valley	$16.00 to 16.25
Heavy melting steel, Pitts	16.50 to 16.75
Heavy melting steel, Chicago	14.00 to 14.50
Stove plate, Chicago	14.00 to 14.50
No. 1 cast, New York	14.50 to 15.00
No. 1 cast, Chicago	18.25 to 18.75
No. 1 cast, Philadelphia	17.50 to 18.00
No. 1 cast, Pittsburgh	15.50 to 16.00
No. 1 cast, Birmingham	16.50 to 17.00
No. 1 cast, Buffalo	16.00 to 16.25
Car wheels, iron, Pittsburgh	16.50 to 17.00
Car wheels, iron, Chicago	15.75 to 16.25
Railroad malleable, Chicago	16.00 to 16.50
Agricultural, mall., Chicago	15.25 to 15.75
Malleable, Buffalo	16.50 to 17.00
Railroad Malleable Pitts	18.00 to 18.50
Nonferrous Metals	Cents per pound
Casting copper, refinery	13.45
Electro copper, producers	13.87½
Straits tin	61.62½ to 61.87½
Lead, New York	8.25 to 8.30
Antimony, New York	14.00
Nickel, electro	39.00
Aluminum, No. 12, prod'rs	26.50
Aluminum, No. 12, remelt	23.00 to 24.00
Zinc, E. St. Louis, Ill	7.20 to 7.25











Comings and Goings of Foundrymen

LEON THOMAS, the new president of the Association Technique de Fonderie de France, was born on July 27, 1878. He studied at the Ecole des Arts et Metiers, Chalons from 1894 to 1897. From 1898 to 1901 he worked as a molder in France, Switzerland and Germany. In 1902 he was chemist at the Forges de Trignac, Saint-Nazaire. From 1903 to 1910, Mr. Thomas was connected with the Usines Piat Soissons, gear manufacturer, where he was supervisor and later assistant manager and then manager. His activities brought him in contact with several firms, and in 1920 has became general manager of the Usines Piat. He was responsible for the reconstruction of the plant which had been destroyed completely during the war. Since 1924 he has been manager of the foundry of the Citroen Works, Paris. Mr. Thomas is one of the founders of the Association Technique de Fonderie, of which he was vice president since 1918. He is a director of several companies and a member of the Society of Civil Engineers, France; the Verein Deutscher Eisenhuttenleute, and the Verein Deutscher Giessereifachleute.

LEON THOMAS

Milton M. Jones, treasurer of the Belle City Mfg. Co., Racine, Wis., manufacturer of farm equipment, has resigned to take an extended vacation. He joined the firm in 1888 as an office boy and 12 years ago was elected treasurer.

F. E. Done, Alameda, Calif., has organized the Oakland Steel Foundry which will be located in Oakland, Calif.

Joseph M. Corson, W. I. Overstreet and E. H. Owen have become associated and have established a brass and aluminum foundry at Portsmouth, Va.

George M. Dyke was elected assistant secretary of the Chain Belt Co., Milwaukee to succeed C. E. Stone who resigned to become vice president of the Interstate Drop Forge Co. F. W. Lowum was elected assistant treasurer.

John A. Penton, chairman of the Penton Publishing Co., Cleveland, publisher of THE FOUNDRY and other business publications, returned June 25 on the MAURETANIA, from a four months' visit to Europe.

Robert Laswell, formerly general superintendent of the Commercial Steel Casting Co., Marion, O., and recently general foreman of Hadfield-Penfield Steel Co., Bucyrus, O., now is connected with the American Manganese Steel Co., Chicago Heights, Ill., as assistant between cleaning room and foundry.

Paul Ropsy, managing director, Belgian Griffin Co., has been elected president of the Association de Fonderie of Belgium. Ivan Lamoureux, manufacturer of foundry equipment, and J. Varlet, manager, Societe Esperance Longdoz, have been elected vice presidents. Mr. Lamoureux is author of the Belgian exchange paper to be presented at the International Foundrymen's congress to be held in Detroit, Sept. 27 to Oct. 1. Mr. Ropsy is expecting to attend the congress.

H. S. Shaeffer who recently became connected with the Erie Forge Co., Erie, Pa., as superintendent of green sand production, began his career with the Pennsylvania Steel Castings Co., Chester, Pa., and later was foreman at the Standard Steel Works Co., Burnham, Pa. He resigned this position to become associated with the Pittsburgh Crucible Steel Co., Midland, Pa. Later Mr. Shaeffer was foreman of the West Steel Casting Co., Cleveland, followed by connections with the Buckeye Steel Castings Co., Columbus, O., and the American Steel Foundries, Granite City, Ill., and Alliance, O. He resigned from the latter company to become general superintendent of the Hadfield-Penfield Steel Co., Bucyrus, O., until his recent connection with the Erie Forge.

H. G. Sommerfield, secretary, London branch, Institute of British Foundrymen, was responsible for the organization of the Foundrymen's convention recently held in London. His task was rendered difficult because the convention was held shortly after the general strike and coal stoppage. Mr. Sommerfield conducts a business in pig iron and foundry accessories.

H. G. SOMMERFIELD

A. B. Root, mechanical engineer, Hunt-Spiller Mfg. Corp., South Boston, Mass., and president of the American Foundrymen's association, has been appointed assistant to the vice president of the Hunt-Spiller company. He will be succeeded by Joseph Goostray as mechanical engineer. Mr. Goostray has been assistant mechanical engineer for four years. During the war he was connected with the submarine base at New London, Conn. The Hunt-Spiller company makes gun iron castings and specializes on railroad work.

Justus H. Schwacke, formerly president and a director of William Sellers & Co. Inc., Philadelphia, has resigned and retired to private life. He has

been with the Sellers company since 1862. He was prominent in National Metal Trades association activities, in the National Founders association and the Metal Manufacturers association of Philadephia. Alexander Sellers was elected president to succeed Mr. Schwacke. He has been with the company since 1896, a director since 1902 and vice president since 1905.

Elected to Office

Charles E. Stone, for several years assistant to the president, Chain Belt Co., Milwaukee, has been elected vice president and general manager of the Interstate Drop Forge Co., Milwaukee. Mr. Stone was graduated from the department of mechanical engineering, University of Michigan, Ann Arbor, Mich., in 1910 and spent several years with the Foos Gas Engine Co., as engineer and purchasing agent. He joined the Chain Belt company in 1918 in charge of purchases. C. C. Bremer who has been comptroller for the Interstate company for many years was elected secretary. C. R. Messinger is president.

Meet In Washington

The fall meeting of the American Electrochemical society will be held at Hotel Washington, Washington, Oct. 7, 8 and 9. Dr. William Blum, president of the society also is chairman of the local committee and is arranging entertainment as well as an attractive technical program. Dr. W. H. Gillett is chairman of the symposium on metals for extreme conditions.

Changes Management

B. M. Horter, formerly of the Philadelphia branch, Cutler-Hammer Mfg. Co., has been appointed manager of the Boston branch. He succeeds J. M. Fernald who resigned. Mr. Horter began as office boy with the Cutler-Hammer company in 1916 and worked through the various departments. During the war he served on a submarine chaser.

To Hold Examination

An open competitive examination for the position of ceramic engineer at the bureau of standards will be held by the United States civil service commission. Applications must be filed at Washington not later than July 27. Applicants should be graduated with a degree in engineering and have at least five years of responsible experience. Evidence of the quality of work accomplished and degree of eminence in his particular sphere also must be submitted.

Starts Brass Foundry

William H. Barr, Inc., 27 Carolina street, Buffalo, has been organized to manufacture brass and bronze bearings and miscellaneous castings. William H. Barr, who for the past 25 years has been associated in nonferrous foundry enterprises, is president of the new organization. John C. McCallum, a production engineer, will serve as general superintendent. The company has secured a foundry building with approximatetly 20,000 square feet of floor space including ample molding facilities.

Elects Officers

Recently, the council of the Association Technique de Fonderie, Belgium, adopted the policy of electing officers each year, the first vice president being the president elect for the next term. As a result of this decision, Paul Ropsy, managing director, Belgian Griffin Co., was elected president. Ivan Lamoureux, manufacturer of foundry equipment, has been elected first vice president and J. Varlet, foundry manager, Societe Esperance Longdoz second vice president.

Obituary

Bartholomew F. Hayes, for 53 years an employe of the Crane Co., Chicago, died June 30 of apoplexy. Mr. Hayes was 67 years old.

Samuel R. Baldwin, superintendent, New Castle Works of the Stove & Range Co., Pittsburgh, died recently at the age of 85. After various associations at Pittsburgh he came to New Castle where he founded the plant known as Baldwin & Graham Stove Foundry which was consolidated in 1899 with the Stove & Range company.

C. Waller Pank, for many years vice president of the Fairbanks-Morse & Co., Chicago died recently from a cerebral hemorrhage. He was 57 years old.

Foundry Association Directory

The Buffalo Foundrymen
Buffalo

President, J. McARTHUR, Washington Iron Works; secretary, W. J. WARK, E. J. Woodison Co., 146 Chandler street. Meetings the third Wednesday of the month at 146 Chandler street.

Chicago Foundrymen's Club
Chicago

President, CHARLES L. LARSEN, Armour Institute of Technology, 3200 Federal street, Chicago; secretary-treasurer, E. C. BARRINGER, THE FOUNDRY, 1147 Peoples Gas building, Chicago. Meetings second Saturday in each month at the City Club, 315 Plymouth court.

Detroit Foundrymen's Association
Detroit

President, ROBERT G. CRAWFORD, Atlas Foundry Co., 131 South Artillery street, Detroit; secretary, RUSSELL M. SCOTT, Packard Motor Co., 1580 East Grand boulevard, Detroit. Meetings third Thursday in each month at the Union League club, 35 Grand River avenue, Detroit.

Metropolitan Brass Foundry Association
New York

President, THOMAS HARPER, Thomas Harper, 204 Lafayette street, New York; secretary, WM. E. PAULSON, Thomas Paulson & Son Inc., 97 Second avenue, Brooklyn, N. Y. Meetings second Wednesday in each month at the Building Trades club, 34 West Thirty-third street, New York.

Newark Foundrymen's Association
Newark, N. J.

President, J. L. CARTER, Barlow Foundry, Inc., Newark; secretary, W. H. MANTZ, Atlas Foundry Co., Irvington, N. J. Meetings called by president.

New England Foundrymen's Association

President, H. P. BLUMENAUER, Arcade Malleable Iron Co., Worcester, Mass.; Secretary, FRED F. STOCKWELL, 205 Broadway, Cambridgeport, Mass. Meetings second Wednesday of each month at the Exchange club, Boston. Outings usually are held in the summer months.

Ohio State Foundrymen's Association

President, WALTER L. SEELBACH, Walworth Run Foundry Co., 2488 West Twenty-seventh street, Cleveland; secretary-manager, ARTHUR J. TUSCANY, 5713 Euclid avenue, Cleveland.

Philadelphia Foundrymen's Association
Philadelphia

President, WALTER WOOD, R. D. Wood & Co., Philadelphia; secretary, HOWARD EVANS, J. W. Paxson Co., Luzerne and D street, Philadelphia. Meetings the second Wednesday of each month at the Manufacturers' club.

Pittsburgh Foundrymen's Association
Pittsburgh

President, WILLIAM K. FRANK, Damascus Bronze Co., South avenue, N. S. Pittsburgh; secretary-treasurer, WM. J. BRANDT, Wm. J. Brandt, Bessemer building, Pittsburgh. Meetings on the 4hird Monday of the month, except in July and August, at Fort Pitt hotel.

Quad-City Foundrymen's Association
Davenport, Iowa

President, J. H. DIEDRICH, Blackhawk Foundry & Machine Co., Davenport, Iowa; secretary-treasurer, A. D. ZIEBARTH, Davenport Foundry & Machine Co., Davenport, Iowa. Meetings the third Monday evening of each month, the meeting place being rotated between Moline, Rock Island and Davenport.

Southern Metal Trades Association
Atlanta, Ga.

President, GEORGE B. COCKER, Gastonia, N. C.; secretary-treasurer, W. E. DUNN JR., Healey building, Atlanta, Ga. The 1926 convention to be held at Macon, Ga., the date to be announced later.

Tri-City Technical Council
Moline, Ill.

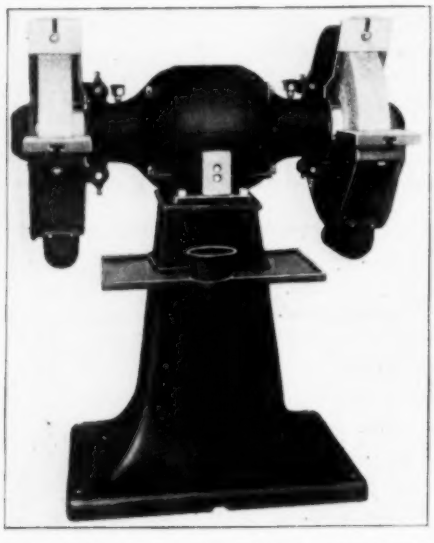
Chairman, H. BORNSTEIN, Deere & Co., Moline, Ill.; treasurer, MAX SKLOVSKY, Deere & Co., Moline, Ill. Combined meetings held only one or two times a year on call.

Tri-State Foundrymen's Association
Cincinnati

President, HAROLD P. RITTER, John A. Oberhelman Foundry Co., 3323 Colerain avenue; secretary, GEORGE W. PIEHL, Wessling Bros. Foundry Co., 1607 McLean avenue. Meetings the second Thursday of each month at the Cincinnati club, Eighth and Race streets.

Twin City Foundrymen's Association
Minneapolis-St. Paul

President, J. A. TEACH, Minneapolis Steel & Machinery Co., Minneapolis; secretary-treasurer, C. E. LANGDON, 3849 Lyndale avenue, So., Minneapolis. Meetings monthly at the Athletic club.



DUSTPROOF BALL BEARINGS ARE USED ON THIS GRINDER

Introduce Heavy Duty Electric Grinder

The Cincinnati Electrical Tool Co., Madison and Edwards roads, Cincinnati, recently has added new 2 and 3 horsepower heavy duty floor grinders for grinding in foundries, automobile factories, railroad shops, etc., to its line of portable electric drills, grinders and buffers. In the new machines, the ball bearings are mounted in dust proof housings and locked to the shaft to provide for end thrust. The spindle is made of steel and is ground to accurate size.

The wheel guards are of the exhaust type and are adjustable to the wear of the wheels. The smaller size grinder is equipped to carry 12 x 2 x 1¼-inch wheels and the 3 horsepower size 14 x 2½ x 1¼-inch wheels. The grinders may be equipped with motors for either alternating current, 220 or 440 volts, 25 to 60 cycles, 2 or 3 phase, or direct current of 115 or 230 volts.

Uses Electrical Heat in Core Ovens

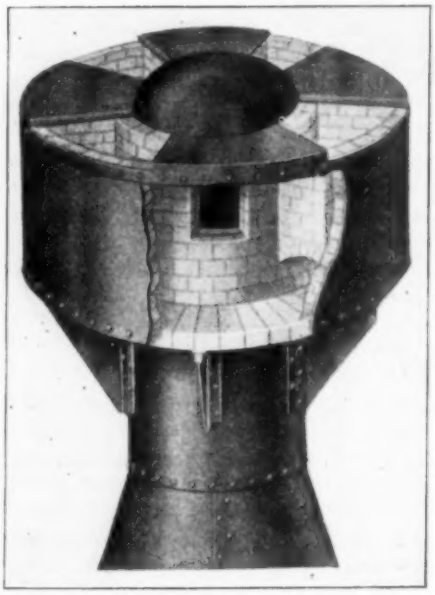
Heating elements for industrial ovens, for such purposes as baking japans, enamels, foundry cores, compounds, insulating materials, and for drying paints and other chemical products, are being marketed by the General Electric Co., Schenectady, N. Y. The heater is available in two ratings for ovens operating at temperatures up to 750 degrees Fahr. and for temperatures to 1150 degrees Fahr. The latter type heater is constructed with a special alloy frame.

All parts of the heater are said to be of ample proportions to withstand continuous service under manufacturing conditions. The unit winding is one continuous ribbon of nickel chromium alloy with the ends electrically welded to the terminal studs, thus eliminating mechanical connections. The insulating supports are molded refractory. The heater is arranged for wall or floor mounting, and where the space is restricted it may be installed in a horizontal position taking but 2½ inches space.

A core oven, equipped with electric heaters manufactured by the General Electric Company, which is installed at the Gleason Works, Rochester, N. Y., is shown in the accompanying illustration. The oven is of the car type and the inside dimensions are as follows: Length 18 feet; width 11 feet, height 8 feet 3 inches. The oven operates at a temperature of 450 degrees Fahr. The heaters are arranged for 60-cycle, 3-phase, 220 volts. This oven is operated at night and bakes approximately 6 tons of cores.

Spark Arrester Is Lined With Firebrick

The Pneulec Machine Co., Ltd., Smethwick, England, has introduced two types of spark arresters for cupolas. In one type, which is shown in the accompanying illustration, the cupola chimney is covered with a steel dome lined with firebricks. Four ports are provided in the walls of each cupola chimney immediately under the dome. Each port leads into a collecting chamber formed in the outer casing or tank. Firebrick cross walls are provided as shown in the illustration, and the bottom halves are cut away to allow the passage of gases to the atmosphere. As the sparks pass through the collecting chamber, they strike either the side walls or the roof, and fall to the bottom. Doors are provided to rake out the sparks.



DOORS ARE PROVIDED TO REMOVE THE SPARKS

The second arrester consists of a circular chamber in which a dome shape baffle plate is hung. Both the chamber and the baffle plate are lined with firebrick, and doors are provided for raking out the spark. The construction is strong and rigid and designed to equal the life of the stack.

THE OVEN IS EQUIPPED WITH ELECTRICAL HEATERS AND OPERATES AT A TEMPERATURE OF 450 DEGREES FAHR.

Equipment Market Is Spotty

Seasonal Slackening in Buying Appears Lighter Than in Several Previous Years—Exports for May Decline Sharply

WHILE the seasonal slump is in evidence in practically all of the distributing centers for foundry equipment, the slackening in several districts has not been as great as in several previous years. In the Cleveland territory the sales in June were highly satisfactory in many cases and inquiries being brought out point to good business in July. One manufacturer reports that his total sales in June were 35 per cent ahead of the corresponding month a year ago.

Equipment business in the Chicago market still seems spotty, but on the whole the trend has been toward improved inquiry and more rapid closing of sales during the past two weeks. Inventory period has cut into trading in the Eastern market. Little is reported in the way of new projects for which substantial lists would be required and there are no large replacement contracts. Particular dullness is noted in conveying equipment and melting units. However, sentiment appears the best in more than a month.

June witnessed an improvement in foundry equipment in the Pittsburgh territory. Inquiries again are numerous, particularly for cupolas, core ovens and blowers. The Bethlehem Steel Corp., wants two 108-inch cupolas; the S. Morgan Smith Co., York, Pa., is in the market for a 96-inch cupola, a motor-driven blower, and a 25-ton ladle; the Steacey-Schmidt Mfg. Co., York, Pa., wants core oven equipment and a large Pittsburgh foundry interest is negotiating for a sand mixer and other equipment. The Pittsburgh Malleable Iron Co., which is installing a steel foundry, is understood to be in the market for considerable equipment, having already purchased four molding machines. The Eureka Planter Co. of Canada which inquired recently for core ovens has decided not to buy.

Crane inquiries include one for a 15-ton crane from the Reliance Steel Casting Co., Pittsburgh, one for a 10-ton 5-motor crane for the Elliott Co., Jeannette, Pa., and one for a 10-ton crane for the U. S. Cast Iron Pipe & Foundry Co., Scottdale, Pa.

An abrupt decline in the demand for foundry equipment has developed in New England during the past two weeks, although a little encouragement is found in plans for some foundry alterations and extensions. A Masschusetts foundry will add an electric steel shop to its gray iron business and now is in the market for $50,000 worth of equipment.

Exports of foundry equipment declined sharply in May according to a report of the department of commerce. The value of exports in May was $51,624 as compared with $154,407 in April and $65,282 in May, 1925. The value of exports for the 11 months ended May 30 was $662,357 as compared with $601,448 during the corresponding period a year ago.

PITTSBURGH MARKET

Core Ovens

Pressed Steel Car Co., McKees Rocks, Pa.; from the Foundry Equipment Co., Cleveland.

American Bridge Co., Ambridge, Pa., installation from the Swartwout Co., Cleveland.

Molding Machines

Pittsburgh Malleable Iron Co., Pittsburgh, four; American Locomotive Co., Richmond, Va., three; from the Herman Pneumatic Machine Co., Zelienople, Pa.

Dust Arrester Equipment

Pittsburgh Plate Glass Co., Pittsburgh; Egan Johnson Steel & Iron Co., Crum Lynne, Pa., dust arrester equipment; from the Pangborn Corp., Hagerstown, Md.

Sand Preparing Equipment

Lycoming Mfg. Co., Williamsport, Pa.; mixer from the National Engineering Co., Chicago.

CHICAGO MARKET

Cranes

Colorado Fuel & Iron Co., Pueblo, Colo., 20-ton overhead; from the Alliance Machine Co., Alliance, O.

Dust Arrester Equipment

Piston Ring Co., Muskegon, Mich.; from the W. W. Sly Mfg. Co., Cleveland.

Molding Machines

Pullman Car & Mfg. Co., Pullman, Ill., one; from the Herman Pneumatic Machine Co., Zelienople, Pa.

Sandblast Equipment

Lavelle Foundry Co., Anderson, Ind., mill; Pullman Car & Mfg. Co., Pullman, Ill., room; International Harvester Co., Chicago, mill; from the W. W. Sly Mfg. Co., Cleveland.

Anderson Engine & Foundry Co., Anderson, Ind.; Maytag Co., Newton, Iowa; sandblast equipment from the Pangborn Corp., Hagerstown, Md.

Scullin Steel Co., St. Louis; from the J. W. Paxson Co., Philadelphia.

Sand Preparing Equipment

Holland Furnace Co., Holland, Mich.; mixer from the National Engineering Co., Chicago.

Shakeout Equipment

Columbia Sanitary Mfg. Co., Louisville, Ky.; Studebaker Corp., South Bend, Ind.; John Deere Tractor Co., Waterloo, Iowa; Griffin Wheel Co., Kansas City, Mo.; Griffin Wheel Co., Council Bluffs, Ia.; Pullman Car & Mfg. Co., Pullman, Ill., Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich. vibrator and shakeout equipment from the Stoney Foundry Engineering & Equipment Co., Cleveland.

Tumbling Barrels

Piston Ring Co., Muskegon, Mich., four; from the W. W. Sly Mfg. Co., Cleveland.

CLEVELAND MARKET

Dust Arrester Equipment

Otis Elevator Co., Buffalo; from the W. W. Sly Mfg. Co., Cleveland.

Sandblast Equipment

National Stove Works, Lorain, O., sandblast equipment; from the Pangborn Corp., Hagerstown, Md.

American Steel Foundries, Alliance, O.; from the J. W. Paxson Co., Philadelphia.

Otis Elevator Co., Buffalo, room and turntable from the W. W. Sly Mfg. Co., Cleveland.

Sand Preparing Equipment

Ohio Steel Foundry Co., Lima, O. laboratory mixer; from the National Engineering Co., Chicago.

Buhl Malleable Iron Co., Detroit, sand separator and blender from the Royer Foundry & Machine Co., Wilkes-Barre, Pa.

Shakeout Equipment

Holmes Foundry Co., Sarnia, Ont., shakeout bails; Holmes Foundry Co., Port Huron, Mich.; Ferro Machine & Foundry Co., Cleveland, vibrator and shakeout equipment; from the Stoney Foundry Engineering & Equipment Co., Cleveland.

NEW ENGLAND MARKET

Sand Preparing Equipment

Worthington Pump & Machinery Corp., East Cambridge, Mass.; Richmond Radiator Co., Norwich, Conn.; Charles Parker Co., Meriden, Conn.; Westinghouse Electric & Mfg. Co., Springfield, Mass.; Builders Iron Foundry, Providence, R. I.; sand separators and blenders from the Royer Foundry & Machine Co., Wilkes-Barre, Pa.

NEW YORK MARKET

Furnaces

National Radiator Co., Johnstown, N. Y., Cupola; from the J. W. Paxson Co., Philadelphia.

Ladles

United States Cast Iron Pipe Co., Burlington, N. J.; battery motor driven reservoir ladles; from the J. W. Paxson Co., Philadelphia.

Molding Machines

Richardson & Boynton Co., Dover, N. J., two; T. H. Symington Co., Rochester, N. Y., one; from the Herman Pneumatic Machine Co., Zelienople, Pa.

Sandblast Equipment

Tonawanda Steel Castings Co., North Tonawanda, N. Y., sandblast equipment; from the Pangborn Corp., Hagerstown, Md.

Willsea Works, Rochester, N. Y., hose sandblast machine; Kennedy Valve Mfg. Co.,

Elmira, N. Y., equipment; from the J. W. Paxson Co., Philadelphia.

Sand Preparing Equipment

Phoenix Brass Co., Irvington, N. J.; Taylor & Co., New York; sand separator and blender from the Royer Foundry & Machine Co., Wilkes-Barre, Pa.

Erie Foundry Co., Rochester, N. Y.; N. W. Kellogg Co., Jersey City, N. J.; Wondersign, Inc., Newark, N. J.; mixers from the National Engineering Co., Chicago.

Miscellaneous

Goulds Pumps, Seneca Falls, N. Y.; loading screen from the National Engineering Co., Chicago.

What the Foundries Are Doing

Activities of the Gray Iron, Malleable, Steel and Brass Shops

Jones Foundry Co., Danville, Pa., is building a plant at South Danville, Pa.

Lobdell Car Wheel Co., Wilmington, Del., will rebuild portion of its south foundry.

Joseph M. Corson, W. I. Overstreet and E. H. Owen have established a brass foundry at 216 Columbia street, Portsmouth, Va.

Jacobs Mfg. Co., Bridgeport, Ala., E. R. Jacobs manager, manufacturer of stoves, will install additional equipment.

Keller Foundry Co., 1010 E. Jackson avenue, Knoxville, Tenn., is building an addition for a brass foundry soon.

Hanks Stove & Range Co., Rome, Ga., will enlarge its plant, including construction of a new warehouse plant.

Central Foundry Co., New York has established an office at Dallas, Tex., in charge of Frederick Soble, who is state manager.

Michaels Art Bronze Co., Scott street, Covington, Ky., has let contract to B. T. Wisenall Co., Crescent street, for a 4-story addition 60 x 62 feet. (Noted May 15).

Illinois Foundry Specialty Co., Morris, Ill., subsidiary of the Western Foundry Co., Chicago, will build a 1 and 2-story addition, for which equipment will be required.

Alloy Cast Steel Co., Marion, O., recently incorporated with $100,000 capital, will start operations shortly in the plant formerly occupied by the Fairbanks Steam Shovel Co.

A Weiskittel & Son Co., East Lombard and Twelfth streets, Baltimore, manufacturer of stoves and castings, is having plans made for a 3-story addition 150 x 280 feet.

Chevrolet Motor Co., General Motors building, Detroit, is taking bids on a heat treating plant, one story, 60 x 130 feet at, Bay City, Mich.

Western Foundry & Supply Co. Inc., New Britain, Conn., Charles A. Danberg and Edward Danberg, owners, has been incorporated with $50,000 capital to operate a brass foundry.

Southeastern Foundry Co., Birmingham, Ala., has moved to 925 Forty-Sixth street, where its new foundry, machine shop and pattern shop have been completed.

Lagrange Iron Works, Lagrange, Ga., L. C. Schaudies president, Morgan street, is taking on a foundry plant with 11,000 square feet floor space, for which equipment will be required.

J. P. J. Heating Corp., Brooklyn, N. Y., has been incorporated with $5000 capital to operat a foundry by H. Jacobs, I. Jacobs and C. Peterson. L. Rabbino, 152 West Forty-second street, New York, is attorney.

Goodman Mfg. Co., Chicago, C. H. Strawbridge president, 4834 South Halsted street, has let contract to Adams Construction Co., 217 North Clarkson court, for an addition for warehouse, pattern shop and heat treating shop.

Metropolitan Steel Casting Co., Newark, N. J. has been incorporated with $100,000 capital to manufacture steel castings by John A. Williams, Irvington, N. J.; Joseph A. Tedesco, Belleville, N. J.; John DeGraw, Newark.

Thomas Wilbraham Green Engineering Co., Philadelphia, has been incorporated with $50,000 capital to manufacture, engines, boilers, blowers and other machinery by Thomas W. Green, 2032 East Madison street, Michael P. Weimar and Harry C. Kuser.

New Trade Publications

MOLDING MACHINES—A description of a new type of molding machine that straddles the sand pile is given in a pamphlet recently published by the Osborn Mfg. Co., Cleveland.

ANTI SLIP TREADS—American Abrasive Metals Co., New York, has issued a leaflet on flooring and stair treads designed to eliminate slipping and accident. It is illustrated to show the forms and varieties of its products.

TRAMRAILS—Material movement through the plant by tramrail system is shown by pictures in a folder issued by the Cleveland Electric Tramrail division of the Cleveland Crane & Engineering Co., Wickliffe, O.

ELEVATORS—New Jersey Foundry & Machine Co., New York, has issued a folder describing the uses of elevators manufactured by this company. Illustrations show the elevators in use.

ELECTRIC HOISTS—Portable electric drum hoists are described in a catalog issued by the Sullivan Machinery Co., Chicago. These hoists are made in the single and double drum and will hoist loads up to 2000 pounds.

SQUIRREL CAGE MOTORS—Century Electric Co., St. Louis, has issued a leaflet describing details of construction of its squirrel cage induction polyphase motors. Illustrations and text show the features of this motor and its construction.

VOLTAGE CONTROL—A current publication by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., covers its regulators for generator-voltage control. It describes the rheostatic type of automatic voltage regulators and special regulator application.

SILENT GEARS—Gears made of its product instead of metal are featured in a catalog by the Fibroc Insulation Co., Valparaiso, Ind. Silence and wearing qualities are presented as advantages in their use. Data tables relating to gears are given.

HELICAL HEAT UNITS—A bulletin by the General Electric Co., Schenectady, N. Y., describes its heating unit and shows applications for various forms of heaters for specific purposes, in which it is bent into various forms to apply the heat as desired.

PRODUCTION TOOLS—A small tool catalog has been issued by Scully-Jones & Co., Chicago, covering its line of production tools for drilling, tapping, reaming and milling. Practical suggestions for their use and complete data as to size are included.

ARC WELDING—The General Electric Co., Schenectady, N. Y., has issued a catalog showing the adaptability of electric arc welding. The catalog is illustrated by many views of materials welded by this process at the plant of the firm.

STEEL SASH—David Lupton's Sons Co., Philadelphia, has issued a catalog on projected steel sash for offices, schools and commercial buildings. This sash is made in two types and the distinguishing features of each are described and illustrated by drawings.

SOLDERING IRON—General Electric Co. has issued a leaflet illustrating its electric soldering iron, showing types for light and heavy duty. Construction of the device is shown and a table of sizes, weights and dimensions is appended.

GRINDERS—Grinding in railroad repair shops is the subject of a booklet by the Norton Co., Worcester, Mass. It shows the machines developed for this service, data and production on various classes of work.

POWER FACTOR CORRECTION—Wagner Electric Corp., St. Louis, has issued a bulletin dealing with the experience of a large corporation in power factor correction by the consumer. Many data of value in computations of this sort are included.

COMPRESSORS—Belt-driven air compressors manufactured by the Sullivan Machinery Co., Chicago, are described in detail in a current bulletin by that company, well illustrated as to the compressors and parts, and their application to various sorts of service.

WELDING AND CUTTING—The various types of torches for welding and cutting and other accessories for this purpose manufactured by the firm are described in a booklet issued by the Alexander Milburn Co., Baltimore. Illustrations are included.

CHAIN DRIVES—Industrial chain drives for economical transmission of power are the subject of a booklet by the Boston Gear Works, Sales Co., Norfolk Downs, Mass. Various types of chain for this purpose are shown and data for their selection presented.

SPEED REDUCERS—A catalog by the Philadelphia Gear Works covers the subject of speed reducers with figures, charts and illustrations. It gives the advantages of these devices in power transmission and illustrates its four types, spur gear, worm gear, spiral-bevel and herringbone.

PORTABLE ELEVATORS—Use of portable elevators for stationary purposes is described and illustrated in a bulletin by the Revolvator Co., Jersey City, N. J. It covers inside and outside work for lifting various materials.

DRIVES—Machine tool drives form the subject of a booklet by the Link-Belt Co., Chicago, showing by text and illustration how chain drive for machine tools gives advantages over other methods. A number of machines using this type of drives are illustrated and described. A number of subjects of interest to machine tool manufacturers also are discussed, speed reduction, unrestricted center distances, working contact of teeth and tool maintenance costs.